SOCIAL MEDIA AND TACIT KNOWLEDGE SHARING: PHYSICIANS' PERSPECTIVES AND EXPERIENCES

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Abstract

Knowledge sharing is critical to improve the quality of patient care in healthcare industry. In particular, tacit knowledge sharing among physicians, such as the sharing of clinical experiences, skills, know-how, or know-whom, is known to have a significant impact on the quality of medical diagnosis and decisions. Information and communication technology (ICT) has been regarded as one of the main enablers of knowledge sharing activities. However, in terms of tacit knowledge sharing researchers still debate whether it can be actually shared through using ICT. This is mostly because most of the traditional information technologies have been found to be unsuccessful in facilitating tacit knowledge sharing among individuals.

With the advent of social web tools, several studies have now argued that these new technologies may provide new opportunities to facilitate tacit knowledge sharing among experts. However, despite these arguments, there is still a lack of understanding and a paucity of empirical research on how social media may facilitate tacit knowledge sharing. Therefore, this study aims to explore the potential contributions of social media in supporting tacit knowledge sharing among physicians.

To provide a theoretical framework, this study adopted organisational (Nonaka and Takeuchi's knowledge creation theory) rather than a philosophical definition and process of tacit knowledge sharing (Polanyi's theory); viewed knowledge as a continuum of tacit to explicit knowledge rather than a dichotomy of tacit versus explicit knowledge; and focused mainly on articulable tacit knowledge compared to inarticulable tacit knowledge (Busch's categorisation of tacit knowledge). These theoretical orientations provided important foundations to theorise and critically examine the influences which impact on physicians' tacit knowledge sharing using social media tools.

Adopting interpretive paradigm, a qualitative survey design was employed to accomplish the research goal. Semi-structured interviews were conducted with twenty-four physicians from around the world who have been active users of social media and have at least five years' clinical experience. The participants were recruited through announcements disseminated mainly on Twitter, and purposive and

snowball sampling was employed. Almost all interviews were conducted over Skype, recorded, transcribed, and entered into the qualitative data analysis program NVivo (version 9). Finally, the interview contents were carefully read several times, coded, and analysed using the thematic analysis approach.

Using thematic analysis, the study revealed five major themes and over twenty sub-themes as potential contributions of social media to tacit knowledge flow amongst physicians. The themes included: socialising, practising, networking, storytelling, and encountering. The study showed that while each theme has a relationship with the literature, the themes also have new meanings in the new context of social media, with new aspects, links, and implications. Using the thematic findings and by integrating Nonaka and Takeuchi's knowledge creation theory and also the continuum of tacit to explicit knowledge, the study proposed a conceptual model that explains the potential contribution of social media to tacit knowledge sharing according to the physicians' perspectives and experiences. The model is unique in terms of contributing and updating the existing literature in the area of ICT support for tacit knowledge sharing, in particular, by demonstrating that social media is one of the recent enablers of tacit knowledge sharing. In addition, the adoption of social media and the challenges that physicians experienced while using social media for knowledge sharing are briefly presented and discussed.

The study develops an important connection between social web communities and tacit knowledge sharing which has implications for the healthcare industry whose clinical teams are not always physically co-located but must exchange their critical experiential and tacit knowledge. The study has opened up a new discussion of this area by demonstrating and conceptualising how social media tools may facilitate tacit knowledge sharing. However, the study acknowledges the need for further empirical studies of other social media tools, and of the need to investigate other contexts, to operationalise the findings of the current study, and to generalise the findings using a larger sample size.

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List of Abbreviations

ACT: Adaptive control of thought

BMJ: British Medical Journal

CR: Coding references

CS: Coding Sources

CoP: community of practice

ECG: Electrocardiography

FOAMed: Free Open Access Medical Education

HCSM: Healthcare and Social Media

HCSMANZ: Healthcare and Social Media, Australia and New Zealand

HCSMUK: Healthcare and Social Media, United Kingdom

HIPPA: Health Insurance Portability and Accountability Act

JAMA: Journal of the American Medical Association

GP: General practitioners

ICT: Information and communication technology

IS: Information systems

IT: Information technology//technologies

KM: Knowledge management

RSS: Really Simple Syndication

SECI: Socialisation, Externalisation, Combination, and Internalisation

SM: Social media

SNS: Social networking sites

TKS: Tacit knowledge sharing

UK: United Kingdom

U.S.: United Sates

WWW: World Wide Web

Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

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Chapter 1: Introduction

1.1 INTRODUCTION

Knowledge sharing among medical practitioners is considered to be critical for improving the quality of patient care. In particular, tacit knowledge sharing amongst physicians, such as the sharing of clinical experiences, skills, know-how, or know-who, is known to have a significant impact on the quality of medical diagnosis and decisions (Abidi, Cheah, & Curran, 2005; Henry, 2006; Paavola, Turunen, & Vuori, 2005; Steininger, Rückel, Dannerer, & Roithmayr, 2010). Tacit knowledge is defined as "highly personal and hard to formalise making it difficult to communicate to others or share with others … is deeply rooted in an individual's action and experience, as well as in the ideas, values, or emotions he or she embraces" (Nonaka & Takeuchi, 1995, p. 215). Sections 2.2 and 2.3 in Chapter 2 provide more in-depth discussion about tacit knowledge and tacit knowledge sharing.

From a healthcare Knowledge Management (KM) perspective, it is vital to harness and facilitate tacit knowledge sharing among clinical teams, particularly when they are not always physically co-located but must nevertheless exchange their critical experiential knowledge (Abidi, et al., 2005). Traditional information technologies (IT) have been found to be unsuccessful in facilitating tacit knowledge sharing among physicians (Abidi, Hussini, Sriraj, Thienthong, & Finley, 2009). It has been argued that traditional IT was more focused on information management than facilitating interaction among knowledge holders, which is necessary for tacit knowledge sharing (Huysman & Wulf, 2005; Marwick, 2001). For tacit knowledge sharing technologies are suggested that provide free-form, real-time, and interactive communication and collaboration platforms (Marwick, 2001; Mitri, 2003).

With the advent of social media tools such as blogs, online social networks, and wikis, several studies have argued that these new technologies may provide new opportunities for facilitating tacit and experiential knowledge sharing among experts (2009; Hsia, Lin, Wu, & Tsai, 2006; 2008; 2010). However, there is still a lack of understanding and a poverty of empirical research on how social media may facilitate tacit knowledge sharing and how to maximise the benefits particularly for tacit knowledge sharing in the healthcare context. Therefore, this study aims to

explore the potential contributions of social media in supporting tacit knowledge sharing among physicians, and demonstrates this by presenting findings from a review of relevant literature and a survey of physicians.

The current chapter provides background information on the research problem. The research objectives, questions, scope, and significance of the study are also outlined in the chapter. Finally, an overview of the research design, working definitions of the terms used in the study, and a thesis outline are provided.

1.2 BACKGROUND TO THE RESEARCH PROBLEM

Today, there is no doubt that one of the biggest, and strategic, assets of an organisation affecting its success and competitive advantage is its knowledge and knowledge sharing activities (Bollinger & Smith, 2001; Burton-Jones, 2003; Constantinescu, 2008; Murray & Peyrefitte, 2007). Generally, there are two types of knowledge found in organisations and between individuals: explicit and tacit. Explicit knowledge is a formal, written down and documented knowledge while tacit knowledge is informal knowledge that resides in an individual's head in forms of mental modes, personal experience, know-how, insight, and paradigms (McAdam, Mason, & McCrory, 2007; Nonaka & Takeuchi, 1995; E. A. Smith, 2001).

From a KM perspective, IT are convenient tools for sharing and disseminating explicit knowledge (Bloodgood & Salisbury, 2001; I. L. A. Lai, 2005). Examples of KM initiatives for managing explicit knowledge range from indexing electronic journal databases to complex expert and artificial intelligence (AI) systems. However, the most valuable and significant amount of human knowledge exists not in formal explicit forms but in tacit forms (Abidi, et al., 2005). Sharing and managing this unstructured tacit knowledge is regarded as very difficult (I. L. A. Lai, 2005) and needs the support of technologies that provide free-form communication and collaboration tools (Mitri, 2003). Examples of traditional methods for sharing tacit knowledge include storytelling, chatting, face-to-face meeting, discussion groups, and more recently, online social networking tools (Marwick, 2001; Nonaka & Takeuchi, 1995; Parker, 2011).

This study is seeking to explore the potential role of social media tools in facilitating tacit knowledge sharing amongst physicians. Conducting the literature review, it was found that three convictions underpin the current study: the

importance of tacit knowledge in the healthcare context, the uncertain role of IT in facilitating tacit knowledge sharing, and an increasing interest and use of social media by healthcare professionals including physicians.

1.2.1 The importance of tacit knowledge in healthcare context

The main objective of KM is to facilitate tacit knowledge acquisition and sharing among experts (Bollinger & Smith, 2001; Kebede, 2010; Saeed Mirza, 2009; Yang, 2006). McDermott (2000) considers that the "real gold" in KM activities is not in disseminating ready-made explicit knowledge, but in sharing tacit knowledge such as ideas, insights, experiences, personal opinions, and beliefs. Penciuc, Abel, and Abeele (2010) also acknowledge that loss of tacit knowledge in an organisation leads to the loss of a certain amount of its main assets, that is, its "collective memory". In general, transferring tacit knowledge is perceived as an important factor in improving the quality of work, efficiency of decision making, organisational learning, productivity, competitiveness, customer service, production of goods, accuracy of task performance, and achieving major savings in time for individuals and organisations (Haldin-Herrgard, 2000; M. H. Selamat & Choudrie, 2004; Wahab, Abdullah, Uli, & Che Rose, 2010).

It has been argued that capturing and facilitating tacit knowledge sharing among employees, along with the exploitation of existing explicit knowledge, are the two top priorities for most organisations today (Quintas, 2002). This is more important in healthcare organisations than in other organisations as patient care is very complex and challenging which requires more of tacit knowledge as well as consumption of explicit knowledge (Steininger, et al., 2010). According to Bate and Robert (2002), finding appropriate ways to encode and transfer healthcare professionals' tacit knowledge held in and shared between organisations is a major issue for future quality improvement initiatives in healthcare organisations. Abidi (2005) also stresses that capturing, formalising, measuring, addressing, and operationalising healthcare tacit knowledge is one of the main issues of healthcare KM in the information era.

Healthcare organisations are characterised as being very tacit knowledge intensive, where both tacit and explicit knowledge are critical for the quality and delivery of patient care (Abidi, et al., 2005; Jean, Jordi, Eduard, & Alfonso, 2003; Saeed Mirza, 2009). The importance of tacit knowledge in the

healthcare industry is well recognised and documented (Abidi, et al., 2005; Engel, 2008; Fox, 1997; Friedman & Bernell, 2006; Greenhalgh, Flynn, Long, & Tyson; Henry, 2006; Kontos & Naglie, 2009; Steininger, et al., 2010). For instance, Steininger et al. (2010) stated that the complexity of finding the right treatment for patients makes the tacit knowledge of medical practitioners more significant than explicit knowledge. Oborn-Barrett and Dawson (2005) also regarded the tacit knowledge of healthcare practitioners as the core of medical knowledge that gives sense to medical information. In addition, it is argued that most medical decisions are being made and most diagnostic processes carried out on the basis of tacit knowledge (Henry, 2006; Paavola, et al., 2005; Steininger, et al., 2010).

The tacit knowledge of healthcare professionals is the most valuable source of their "experiential know-how" and is related to their clinical experiences in vital situations – it is about "*what really works and how to make it work*" rather than explicit knowledge of "*how things should work*" (Abidi, et al., 2005, p. 194, italics in original). It is omnipresent in every part of all healthcare settings in the forms of "the working knowledge of health-care experts", "the social knowledge ingrained in collaborative problem-solving", "educational discussions between healthcare practitioners", "the communication patterns between a community of practitioners leading to the manifestation of an expert network", and even in "clinical episodes recorded in electronic patient records" (Abidi, et al., 2005, p. 193).

The discussion above highlighted the importance of tacit knowledge sharing in healthcare settings by regarding it as one of the important factors that influences the quality of clinicians' decision-making processes during clinical encounters. It has been viewed as an essential asset in improving the quality of patient care. Consequently, from a healthcare KM perspective it is necessary to harness and facilitate tacit knowledge sharing among clinical teams who may not always be physically co-located but must exchange their experiential knowledge (Abidi, et al., 2005). However, the mechanisms, channels, and technologies required for this differ, and are subject to disagreement.

1.2.2 Information technology (IT) and tacit knowledge sharing

IT has been regarded as one of the main enablers of knowledge sharing activities (Brink, 2003; Chennamaneni & Teng, 2011). However, in terms of tacit knowledge sharing there is currently no consensus on whether IT can facilitate tacit

knowledge sharing (Falconer, 2006; Haldin-Herrgard, 2000; Hildrum, 2009; Johannessen, Olaisen, & Olsen, 2001; Roberts, 2000). It has been argued that traditional IT had been more focused on information management rather than facilitating interaction among the knowledge holders which is necessary for tacit knowledge sharing (Garcia, 2009; Huysman & Wulf, 2005; Marwick, 2001). That is why researchers have argued that for tacit knowledge sharing technologies are needed that provide free-form, real-time, and interactive communication and collaboration platforms (Marwick, 2001; Mitri, 2003).

There is a major debate taking place among researchers about whether IT can have a role in tacit knowledge sharing among individuals. Some researchers, particularly those who conducted their study before the introduction of social web tools such as blogs, online social networks, and wikis, insist that tacit knowledge sharing through using IT is too limited if not absolutely impossible to achieve (Flanagin, 2002; Haldin-Herrgard, 2000; Hislop, 2001; Johannessen, et al., 2001). Others argue that IT can partially facilitate tacit knowledge sharing although it may not be as rich as face-to-face interactions (Alavi & Leidner, 2001; Chatti, Klamma, & Jarke, 2007; Falconer, 2006; R. Harris & Lecturer, 2009; Hildrum, 2009; Lopez-Nicolas & Soto-Acosta, 2010; Marwick, 2001; Murray & Peyrefitte, 2007; Sarkiunaite & Kriksciuniene, 2005; M. H. Selamat & Choudrie, 2004; Stenmark, 2000). Each group of proponents has its own reasons and explanations.

The debate on whether IT can facilitate tacit knowledge sharing is ongoing, which can be considered as a major gap of KM literature. However, in line with the group of researchers who argue that IT can at least partially facilitate tacit knowledge sharing, this study postulates that IT can indeed enable individuals to share tacit knowledge (particularly knowledge with a low to medium degree of tacitness) by providing better mechanisms for processing, delivering and exchanging of valuable knowledge as well as by building an environment that allows experts to locate each other and socially interact about issues related to their job (Falconer, 2006; Marwick, 2001; M. H. Selamat & Choudrie, 2004).

Researchers have suggested a variety of IT tools for facilitating tacit knowledge sharing which range from communication tools (e.g. instant messaging and discussion forums) to collaborative platforms, multi-media sharing tools, video conferencing, online communities and finally Web 2.0 tools such as blogs, wikis, and

social networks (Ardichvili, Page, & Wentling, 2003; Davidaviciene & Raudeliuniene, 2010; R. Harris & Lecturer, 2009; Hildrum, 2009; Khan & Jones, 2011; I. L. A. Lai, 2005; Marwick, 2001; M. Mayfield, 2010; Mitri, 2003; G. Murphy & Salomone, 2012; Murray & Peyrefitte, 2007; Nilmanat, 2011; Parker, 2011; E. A. Smith, 2001; D. Song, 2009; Wan & Zhao, 2007; Yi, 2006).

Social web tools have been viewed in the literature as one of the recent enablers of tacit knowledge sharing. It has been argued that these technologies may have the ability to alleviate some of the issues and challenges existing in the tacit knowledge sharing process among experts. For example, Khan and Jones (2011) suggested that, as new social web technologies emerge in the form of online social networks, blogs, and wikis and are being used widely in organisations, these new ways of communication and these new communities must be addressed in the discussions on tacit knowledge sharing. Hsia, et al. (2006), Abidi (2009), and Steininger, et al. (2010) also argued that social web technologies are effective tools for the facilitation of the transfer of tacit knowledge among clinicians. A few studies (Chatti, et al., 2007; Lopez-Nicolas & Soto-Acosta, 2010; Marwick, 2001; G. Murphy & Salomone, 2012; Sarkiunaite & Kriksciuniene, 2005) have also attempted to make a link between social web technologies and Nonaka and Takeuchi's (1995) knowledge creation theory to demonstrate how social web tools might be helpful in facilitating the conversion of knowledge from tacit to explicit and also from explicit to tacit.

Despite it being argued in the literature that tacit knowledge sharing takes place in social web environments, it was noticed that there is still a lack of empirical studies supporting the arguments and a lack of understanding of how social media may facilitate tacit knowledge sharing. In addition, social media platforms and their affordances have changed significantly even over the comparatively short timeframe during which they emerged. No studies have so far empirically investigated Facebook, YouTube, or Twitter particularly well, since these platforms only became widely popular after these studies were conducted. There is a need to re-investigate users' opinions of these recent web technologies in terms of their efficacy and capacity for tacit knowledge sharing, the most critical knowledge of people and organisations.

1.2.3 Increasing interest and use of social media in healthcare

The use of Internet as a communication tool and as one of the principal sources of medical information has become increasingly popular among healthcare professionals (Bennett, Casebeer, Zheng, & Kristofco, 2006; Romano, Gesualdo, Pandolfi, Tozzi, & Ugazio, 2012; Séverin, Kurosinksi, Verbraeken, Simonds, & Palange, 2012). Among the Internet initiatives, social web tools such as blogs, wikis, and social networking websites have also become the preferred tool for communication and collaboration by healthcare professionals in recent years (Antheunis, Tates, & Nieboer, 2013; Cooper et al., 2012; McGowan et al., 2012).

Physician-only social networks such as Sermo, Ozmosis, and Medscape have attracted over 100, 000 members each. Surveys show that more than sixty per cent of US physicians use social media or relevant participatory media to look for medical information and to communicate with peers (Cooper, et al., 2012; Manhattan Research LLC, 2012b; McGowan, et al., 2012). Similarly, European physicians have also begun to embrace most social media tools (Antheunis, et al., 2013; Lulic & Kovic, 2012). The use of smartphones and tablets has also increased significantly among physicians around the world (Manhattan Research LLC, 2012b).

Such interest in and use of social media in healthcare requires further research to discover the potential (or shortcomings) of these emerging tools in regard to the specific information needs of medical communities. Most of the research that has been done thus far in the area of social media in healthcare has been about usage patterns (Antheunis, et al., 2013; Cooper, et al., 2012; Lulic & Kovic, 2012; McGowan, et al., 2012). Only a few studies have been conducted to investigate knowledge sharing, particularly tacit knowledge exchanging, among physicians in online social media communities.

The three convictions discussed above established rationale for the current study and led the researcher to define the problem as follows.

1.3 PROBLEM STATEMENT

The review of the relevant literature showed that there are two research gaps regarding the use of social media by healthcare professionals. First, there is a major debate ongoing among researchers regarding the viability of ICT in general for tacit knowledge sharing. Second, although social web tools are viewed as recent enablers

of tacit knowledge sharing by some authors (Abidi, et al., 2009; Dave & Koskela, 2009; Hsia, et al., 2006; Steininger, et al., 2010; Zheng, Li, & Zeng, 2010), there is still a lack of empirical studies supporting their arguments, and investigations into how current social media tools facilitate tacit knowledge sharing.

In particular, very few studies have been conducted in a healthcare context to date to explore the potential contributions of social media for tacit knowledge sharing among physicians. Social web sites are currently very popular and attracting increasing interest of physicians and healthcare organisations for knowledge sharing, and this require further investigation. Hence, the current research aims to bridge this gap by investigating how social media can facilitate tacit knowledge sharing among physicians. More exploration and deeper understanding is needed when ICT, particularly social media, is used for capturing and sharing experts' tacit knowledge. This study seeks to re-conceptualise tacit knowledge sharing in the social web era by exploring physicians' experiences with and perspectives on utilising social media for tacit knowledge sharing.

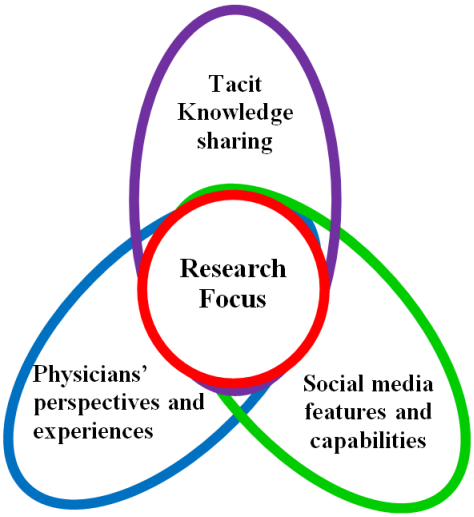

Figure 1.1. Research focus.

Figure *1.1* illustrates the main areas of concern and focus of the study. As it shows, this study is placed at the intersection of three areas: social media features and capabilities, tacit knowledge sharing, and physicians' perspectives and experiences. The interaction between these three constitutes the scope of the study. The study investigates social media's contribution to tacit knowledge sharing from the perspectives and experiences of physicians. Therefore, physicians' perspectives and experiences are the primary units of observation of the study. Accordingly, tacit

knowledge sharing and how social media may facilitate it constitutes the unit of analysis of the study. The scope of the study will be discussed further in the following sections.

1.4 RESEARCH AIMS AND QUESTIONS

The research gap identified in the literature helped to define the research problem, as discussed above. This also assisted to define the overall aim, the main research question, and a set of objectives to answer the main research question. The overall aim of the study was to explore and identify the potential contributions of social media in facilitating tacit knowledge sharing among physicians. The main research question was also formulated as follows:

How does social media facilitate tacit knowledge sharing among physicians?

To achieve the main research goal and to answer the research question, a number of specific objectives were also considered. These are as follows:

1. To explore the patterns and nature of knowledge being shared among physicians on social media by adopting a tacit-explicit continuum of knowledge (Chapter 4);
2. To explore and explain the possible applications and contributions of social media in facilitating tacit knowledge sharing among physicians (Chapters 5 and 6);
3. To develop a conceptual model showing the main potential contributions of social media in facilitating tacit knowledge sharing (Chapter 6); and
4. To investigate the use of social media tools among physicians including their patterns of use, their reasons for their use and the challenges they experience using these new platforms (Chapters 4 and 5).

1.5 DELIMITATION AND RESEARCH SCOPE

The scope of the study was defined as follows. First, the study adopted an organisational rather than a philosophical definition of tacit knowledge. Tacit knowledge is a debatable concept in terms of whether it can actually be researched, observed, and operationalised. The early definition of tacit knowledge, found in Polanyi's view of "tacit knowing", defines tacit knowledge as an inexpressible

knowledge residing in human minds (Polanyi, 1966). However, this may not easily be accessible and transferable through information technology, as has been argued by some researchers (Flanagin, 2002; Haldin-Herrgard, 2000; Hislop, 2001; Johannessen, et al., 2001) in the past.

Polanyi's philosophical view of tacit knowledge has now been slightly changed in organisational KM studies, particularly by work of Nonaka & Takeuchi (1995), to a knowledge that is to some extent articulable and expressible in certain situations, and is classified into different types of tacit knowledge based on the degree of its tacitness and its expressibility (Oguz & Sengün, 2011). Therefore, for the purpose of this study the organisational definition of "tacit knowledge" seems more applicable and adoptable (Oguz & Sengün, 2011). This definition allows for a better understanding of the phenomenon of tacit knowledge sharing using IT than Polanyi's view, which seemingly does not see a role for IT in tacit knowledge sharing.

Therefore, by adopting an organisational definition of tacit knowledge, this study mainly explored the types of tacit knowledge that physicians acquired personally or as a group at their workplace, and it could be shared to some degree through chatting and conversing or it could be demonstrated through the use of multimedia tools. In other words, the main focus of the study was on the physicians' experiential knowledge relating to their practical skills, expertise, personal professional opinions and perspectives, and other job-specific knowledge and experiences. Inexpressible and less-articulable types of tacit knowledge in the forms of mental modes, gut feelings, hunches, intuitions, and some physical and hands-on experiences which may not be transferred through IT were excluded for the study.

Second, the distinction between tacit and explicit knowledge is not as clear in reality as in the theoretical definitions. In other words, determining whether the knowledge shared between two people is really tacit or explicit is not easy in many cases, because the nature of tacitness always changes according to the level of the person's knowledge and expertise (novice or expert), the time, and the context in which the knowledge is obtained and shared. That is why a group of researchers viewed tacit and explicit knowledge along a continuum rather than as two very distinct categories (Chennamaneni & Teng, 2011; Haldin-Herrgard, 2000; Jasimuddin, Klein, & Connell, 2005). The study also adopted a tacit-explicit continuum in analysing the data to explore the contributions of social media to tacit

knowledge sharing. This not only enabled an investigation of pure tacit or explicit knowledge sharing, but also an examination of the knowledge that is placed in between, that is, the knowledge that is just converted from tacit to explicit, but still has components of the tacit dimension.

In addition, based on Nonaka and Takeuchi's (1995) knowledge creation theory, the study viewed tacit knowledge sharing as not only including tacit-to-tacit conversions (socialisation) but also tacit-to-explicit (externalisation) and explicit-to-tacit conversions (internalisation) (Lopez-Nicolas & Soto-Acosta, 2010; Marwick, 2001; McDermott, 1999; Sarkiunaite & Kriksciuniene, 2005). This is because tacit and explicit knowledge have an interactive and dynamic relationship with one another and discussing one inevitably necessitates discussing the other as well. In addition, considering the spiral movement of the knowledge creation process in Nonaka and Takeuchi's theory, tacit knowledge eventually needs to be externalised and also internalised to be communicated.

Third, the study initially approached investigating social media as a whole rather than limiting it to one specific group of social web sites (for example, social networks, wikis, or blogs). The reason for not choosing specific types of social media tools was that the study sought to obtain a holistic view of the social media's contribution to tacit knowledge sharing and such an overarching view might not be achievable by examining only one or two types of social media tools. For example, wikis might be good for mediating tacit knowledge capturing and sharing processes by providing a platform through which people can collaboratively create and share content. However, wikis might lack the advantage of multimedia sharing tools in facilitating the demonstration of a skill or capturing what is hard to explain through language (i.e. tacit knowledge). Wikis might also lack the advantage of social networks in supporting tacit knowledge sharing by providing the ability to locate experts in a particular field or of a particular skill, and also by providing better facilities for chatting, discussing, and rapport building.

In addition, most social media platforms now use a combination of different tools in a single place (for example, social networks may allow embedding wikis or blogging features in their platforms, or wikis and blogs may allow the use of multimedia files), and this makes it difficult to study a single tool in isolation, without looking at its relationships with other tools. Therefore, limiting social media

tools to one or two cases was initially deemed inappropriate to accomplish the goals of the study and to obtain a holistic view of social media's contribution to tacit knowledge sharing. However, after the data collection it was found that the study participants mainly used Twitter, blogs, and multimedia sharing sites (such as YouTube and Vimeo) as part of their everyday professional knowledge seeking and sharing activity. Therefore, the discussions in this study mostly cover the support of these three platforms of social media in facilitating tacit knowledge sharing among physicians. Future research might extend the findings of the present study by examining specific social communities and different social web tools to increase the representativeness and generalisability of the study findings.

Fourth, selection of the study participants was based on three pre-defined criteria: having a minimum of five years clinical experiences, being a regular user of social media, and being accessible for the study; these are explained in Chapter 3. The selection of the participants was not limited to specific geographical locations since the study was conducted online and it was expected that the results would not be affected by geographical location.

The study participants were also not limited to specific professional categories of physicians, at least not in the early stages of the study, because it was not the aim of the study to deeply explore the nature or application of medical tacit knowledge held by specific groups of physicians. Instead, the focus was on the mechanisms of tacit knowledge sharing, and in particular, on exploring the potential of social media in facilitating this process amongst physicians. In addition, recruiting an adequate number of specific groups of physicians who used social media regularly was not possible since such groups were not accessible to the researcher at the time of data collection. Therefore, physicians from all specialties were initially targeted for data collection.

Fifth, the assumption of the study was that participants' responses during the interviews were honest and reflected their true perceptions, experiences, and activity patterns of using social media for knowledge sharing. Finally, the study had some practical and generalisability limitations, and these will be discussed in the final chapter of the thesis.

1.6 OVERVIEW OF THE RESEARCH DESIGN

The research design, that is, the particular strategies and methods employed to answer the research questions, is an important part of every study. A research design should be developed on the basis of the research goal and corresponding questions (Onwuegbuzie, Teddlie, & Tashakkori, 2003). The purpose of the study was to investigate the potential contributions of social media in facilitating tacit knowledge sharing among physicians.

The study was an exploratory study which adopted an interpretive paradigm. A qualitative survey design with a semi-structured interview was employed to collect data. The study participants were physicians (general practitioners, specialists, and surgeons) who had worked in clinical practice for at least five years and who were also active and regular users of social media. A total of twenty-four participants were recruited using purposive and snowball sampling techniques.

Using semi-structured interviews, the participants' perspectives and experiences were sought in relation to the viability of social media tools for tacit knowledge sharing. The qualitative data collected in the interviews were then transcribed, coded, and analysed, using a thematic data analysis approach. Next, the findings of the study were reported by presenting the five main themes that emerged from the data. Finally, the findings of the study were discussed in relation to the past literature to develop a conceptual model of social media use for tacit knowledge sharing.

The overall research design of the study is represented in Table 1.1 (see previous page). Defining the research topic was discussed in this chapter as phase one of the study, and other phases will be introduced in the following chapters.

Table 1.1

The Overall Research Design

Phases of the study	Steps of each phase
Defining the research topic	- Defining the research problem - Defining the research objectives and questions - Explaining the significance of the study - Defining the scope and limitations of the study
Conducting literature review	- Critical review of existing literature - Familiarisation with the topic - Determining the research gap - Revising the research question and scope
Research design	- Qualitative survey design - Methodology justification - Decisions on: ▪ Population and sampling ▪ Data collection ▪ Data analysis
Implementation	- Developing interview guide - Developing interview questions - Guidelines for selection of participants - Ethical clearance - Conducting pilot study - Revising interview questions - Recruiting study participants - Conducting main interviews
Data analysis	- Preparing and managing the data collected - Transcribing the interviews - Coding - Conducting thematic content analysis - Identifying key themes of the study
Thesis writing	- Reporting the research results - Discussing the findings - Discussing limitations and recommendations - Conclusions

1.7 KEY FINDINGS

The study showed that physicians share various types of explicit knowledge (such as contents from published materials, links, and medical news and events) and tacit knowledge (such as clinical tips, opinions, experiences, and best practices) on social media. In terms of answering the main research question, the study identified five major themes and over twenty sub-themes that could be regarded as potential contributions of social media tools to facilitate tacit knowledge sharing, according to the participants' viewpoints and experiences. The main themes included:

- Socialising

- Practising
- Networking
- Storytelling
- Encountering

The study also revealed that physicians experience some challenges when using social media for knowledge sharing. The major challenges included: maintaining patients' confidentiality, lack of active participation, finding time, lack of trust, workplace acceptance and support, and information anarchy. The study also discussed the importance of trust in the process of tacit knowledge sharing on social media, in particular, the study revealed that physicians approach peers and trust differently on social media. The main processes of developing trust on social media were found to be the following: previous personal interactions, observing authenticity and relevancy of voice, professional standing, consistency of communication, non-anonymous and moderated sites, and peer recommendations.

Finally, based on the five themes that had emerged from the data, and also with the help of previous theories (particularly Nonaka and Takeuchi's (1995) knowledge creation model), a conceptual model of tacit knowledge sharing using social media tools was also proposed that could be regarded as one of the main contributions of the study. Particular contributions of the study to knowledge and also practical implications of the study are discussed in detail in the final chapter of thesis.

1.8 DEFINITION OF KEY TERMS

Social media: Broadly, online social media refers to a new wave of World Wide Web technologies that has brought interactivity, collaboration, possibility of peer-to-peer communication, networking, user-generated content, and multi-media-oriented and easy-to-use web applications running over the Internet. The main focus of social media technologies is on enabling users to be more active on the Internet; to produce, participate, collaborate and share knowledge or communicate with other people (Lindmark, 2009). Examples of social media tools include blogs, wikis, social networking sites, micro-blogging, and social bookmarking.

As mentioned above, the study participants predominantly used Twitter, blogs, and multimedia sharing sites such as YouTube and Vimeo. Therefore, the study

mainly discussed the support of these platforms in facilitating tacit knowledge sharing among physicians.

Knowledge sharing: Knowledge sharing is a process of communicating "meaningful information, along with interpretations and potential applications of the information" which is exchanged between individuals, groups or organisations (Law, 2009; p. 846). It is one of the main processes of KM activities, consisting of different techniques and methods of knowledge sharing and collaboration between individuals (Bose, 2003; Saeed Mirza, 2009).

Tacit knowledge: Tacit knowledge, put simply, refers to knowledge that is unspoken and unwritten, and resides in human minds (as opposed to explicit knowledge which is formal and documented knowledge). Tacit knowledge is a complex concept that can be characterised as a "personal, difficult to articulate fully, experience based, contextualised, job specific, held within, both known and unknown to the holder, transferred through conversation and narrative, and capable of becoming explicit knowledge and vice versa" (McAdam, et al., 2007; p.45). Examples of tacit knowledge include personal experience, know-how, insight, mental modes, expertise, personal beliefs, and professional opinions.

For the purpose of this study, first, an organisational definition of tacit knowledge rather than a philosophical or psychological definition was adopted. Second, the study viewed knowledge as a continuum of tacit to explicit knowledge rather than a dichotomy of two types of knowledge, i.e. tacit vs. explicit knowledge. Third, Busch's (2008) categorisation of tacit knowledge into articulable and inarticulable tacit knowledge was adopted. Articulable tacit knowledge such as tips, tricks of the trade, and demonstrable skills which can eventually be articulated is the main focus of the current study. Further, more detailed information is provided in the next chapter.

Physician: A physician is "a skilled health-care professional trained and licensed to practice medicine" (Merriam-Webster, 2013). The term has been used differently around the word. For example, in the United Kingdom it refers to a general practitioner or specialist in internal or general medicine who is usually distinguished from a surgeon. However, in the United States the term physician is a general term used for any authorised medical practitioner (Martin & Alexander, 2010). For the purpose of this study, the general definition of physician was adopted

and hence all groups of physicians such as general practitioners, specialists, and surgeons involved in clinical practice were initially targeted.

1.9 ORGANISATION OF THE THESIS

The remainder of the thesis is organised into six chapters as follows:

Chapters 2, *Literature Review*, presents a critical review of the literature on the topic, encompassing studies on ICT contributions to tacit knowledge sharing, including social media potentials for tacit knowledge sharing, with a special focus on the healthcare context. The chapter provides a theoretical foundation for the study and ends up revealing a significant research gap, thus providing a direction for the study.

Chapter 3, *Research Methodology*, discusses the research design and the methodology employed in the study. This chapter presents the rationale for the choice of methodology (qualitative survey), the procedures for conducting the data collection (semi-structured interview), and the data analysis (thematic analysis).

Findings of the study are presented in two chapters (Chapters 4 and 5): Chapter 4, *The Participants*, reports general findings of the study, comprising demographic information, coding information, information about social media use by physicians, and the types of knowledge physicians usually share on social media. Chapter 5, *Social Media Support for Tacit Knowledge Sharing*, provides the main findings of the study in relation to the social media support for tacit knowledge sharing. This chapter presents and discusses the five main themes and the associated sub-themes that have emerged from the data. Chapters 4 and 5 also reveal challenges that physicians experienced while using social media for knowledge sharing purposes.

Chapter 6, *Discussion of the Findings*, discusses the major findings of the study in the context of past literature to develop a conceptual framework that explains tacit knowledge sharing over social media. Chapter 7, *Conclusion*, concludes the thesis by presenting the limitations of the study and the contributions and implications of the study, and makes recommendation for future research.

Finally, the *Appendices* contain further information related to the data collection and the data analysis processes used in the study.

1.10 CHAPTER SUMMARY

The current chapter has provided a background to the study, the importance of tacit knowledge in healthcare organisations, particularly among physicians, and the need for the use and optimisation of emerging information technology in facilitating tacit knowledge sharing in current business modes where physicians are not always physically co-located. The chapter also outlined the main objectives of the study and the research questions, and briefly described the research design of the study. The chapter also provided a rationale for the study by pointing to its significance.

The next chapter, Chapter 2, will present a review of the relevant literature.

Chapter 2: Literature review

2.1 CHAPTER PREVIEW

As outlined in Chapter 1, the purpose of the study is to explore the potential contributions of social media in facilitating tacit knowledge sharing among physicians. This chapter presents and reviews the relevant literature, beginning with a review of the concepts of knowledge, tacit knowledge, tacit knowledge sharing, and the importance tacit knowledge in clinical practice. The chapter continues with a presentation and discussion of the arguments in the literature about the contribution of information and communication technology (ICT) to tacit knowledge sharing. In particular, the existing schools of thought in the realm of information technology (IT) for tacit knowledge sharing are introduced. The difficulties of tacit knowledge sharing through ICT are then discussed. This is followed by examples of studies that investigated tacit knowledge sharing in online environments.

Next, the chapter introduces social media and their characteristics. Then, it discusses the potential contribution of social media to tacit knowledge sharing according to the literature. The chapter concludes by discussing the findings reported in the literature, revealing a knowledge gap of relevance to the current study.

2.2 KNOWLEDGE

Knowledge is currently regarded as one of the most strategic and critical assets that organisations need to sustain a competitive advantage in the information age (Choi, Poon, & Davis, 2008). However, what knowledge actually means is still widely debated. Plato's view of knowledge as a "justified true belief" is still considered a general definition of knowledge (Nonaka & Takeuchi, 1995, p. 21). However, a definition provided by Davenport and Prusak (2000, p. 5) is currently more commonly adopted in the literature: "fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information".

Knowledge has also been viewed from various epistemological perspectives. It has been regarded as "an object" that can be stored, transferred, and manipulated; a "process" that can be applied in practice; a "state of mind" or the fact of knowing

and understanding; an ability to "access to information"; a "capability" to find and use information; and a "knowledge vis-à-vis data and information" (Alavi & Leidner, 2001). Discussing the various epistemological arguments in relation to the meaning of knowledge is beyond the scope of this study. However, explaining a hierarchical view of knowledge (also called a knowledge pyramid), which is most popular in knowledge management (KM) and IT literature, might be helpful in the context of this study (Alavi & Leidner, 2001).

In a hierarchical view (see Figure 2.1), knowledge is distinguished from data, information and wisdom. Data are defined as raw facts (symbols, letters, and numbers) representing a reality. Data do not necessarily have inherent meaning. Information is meaningful and useful data that are organised, processed, and used to create knowledge. Once information is further processed, interpreted, contextualised, and combined with understanding, experience, and capability, it becomes knowledge. Finally, wisdom refers to accumulated knowledge which enables people to see beyond the horizon and provide practical insights (Bierly, Kessler, & Christensen, 2000; Davenport & Prusak, 2000; Faucher, Everett, & Lawson, 2008; Rowley, 2007).

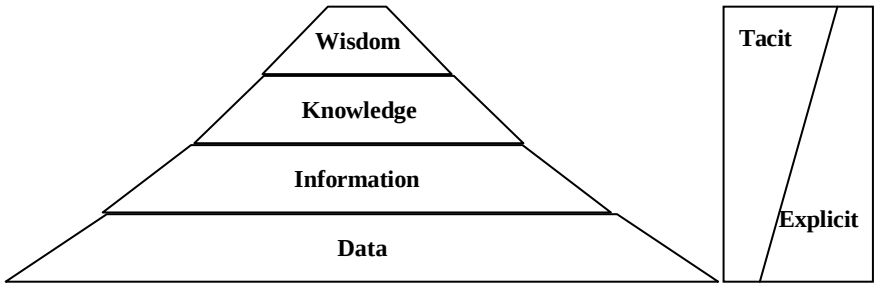

Figure 2.1. The knowledge hierarchy and tacit/explicit continuum.
Sources: Faucher, et al., 2008; Rowley, 2007

In other words, data alone is "know-nothing", information deals with "know-what", knowledge is about "know-how" and wisdom contains "know-why" (Zeleny, 1987). While data and information can be viewed as human-independent entities, knowledge and wisdom are attached to human (Zheng, et al., 2010). As shown in Figure 2.1, as raw data progresses towards wisdom, they contain more tacit dimensions. Wisdom possesses the highest level of tacit knowledge.

Several typologies of knowledge have also been developed to identify specific types and dimensions of knowledge. Lundvall and Johnson (1994) categorised

knowledge into four groups: know-what, know-why, know-who (when and where) and know-how. Blackler (1995) proposed a typology of knowledge consisting of embodied, embedded, embrained, encultured and encoded knowledge. Anderson (1983, 1989) in his ACT[1] theory identified three knowledge types: declarative, procedural, and working knowledge. Boisot (1995) also suggested four types of knowledge as proprietary, public, personal, and commonsense knowledge. Polanyi's (1966) knowledge classification consisted of personal (tacit) knowledge and codified (explicit) knowledge. Nonaka and Takeuchi (1995) specified two types of knowledge, tacit and explicit. For Choo (1998), there are three types of knowledge: tacit, explicit and cultural knowledge. Bhatt (2001) acknowledged background and foreground knowledge dimensions.

Among the different knowledge taxonomies presented above, Nonaka and Takeuchi's classification of knowledge (tacit-explicit knowledge) was adopted for the purpose of this study, as it is still the most commonly used as well as the most practical classification of knowledge suggested in the literature (Pathirage, Amaratunga, & Haigh, 2007; Vlok, 2004). According to Nonaka and Takeuchi (1995), knowledge is either tacit or explicit. Tacit knowledge refers to the personal knowledge residing within an individual's head in the forms of personal experience, know-how, insight, mental modes, and personal beliefs, whereas explicit knowledge refers to well-articulated knowledge that is written down and documented (Nonaka & Takeuchi, 1995).

Tacit knowledge is mostly abstract and human-dependent, while explicit knowledge is formal knowledge and usually independent of its human carrier (Grutter, Stanowvska-Slabeva, & Fierz, 1999). Therefore, codifying and transferring tacit knowledge is more difficult than codifying and transferring explicit knowledge. Tacit knowledge might be disclosed in everyday discussions, face-to-face informal meetings, and also in organisational routines, reports, and new products, whereas explicit knowledge can be found in textbooks, journals, guidelines, and electronic databases (Bloodgood & Salisbury, 2001; Groff & Jones, 2003; Haldin-Herrgard, 2000; Rebernik & Sirec, 2007).

[1] Adaptive Control of Thought

The properties of both tacit and explicit knowledge are briefly presented in Table 2.1. The main focus of KM is based on managing tacit knowledge rather than explicit knowledge (Bollinger & Smith, 2001; Kebede, 2010; Saeed Mirza, 2009). More details about the concept of tacit knowledge are provided in the next section.

Table 2.1

Properties of Tacit and Explicit Knowledge

Tacit Knowledge	Explicit knowledge
- Unstructured, difficult to see, codify, estimate, investigate, formalise, write down, capture, and communicate accurately	- Articulated, structured, well-documented, easy to recognise, codify, formalise, store, share, communicate, and use
- Mostly unconscious and invisible knowledge	- Consciously accessible and visible
- Subjective, know-how, practical, job specific, experience-based, context-specific, here and now, and expert's knowledge	- Objective, know-that, know-what, declarative, formal, there and then, and academic knowledge
- Rarely documented, highly individual, resides in human minds and also in relations	- Can be found in books, journals, and databases
- Difficult to learn: learnt through personal experience, practice, apprenticeship, observation, imitation, and reflection	- Easy to learn: learnt through instruction, procedures, recitation, or repetition
- Transferred through conversation, storytelling, discussions, analogies, and demonstrations	- Transferred using any information sharing medium

Sources: Dampney, Busch, & Richards, 2002; Haldin-Herrgard, 2000; McAdam, et al., 2007; Nonaka & Takeuchi, 1995; Pavlicek, 2009; E. A. Smith, 2001

2.3 TACIT KNOWLEDGE

Michael Polanyi coined the term tacit knowledge in his 1966 book *The Tacit Dimension* (Friedman & Bernell, 2006). His most commonly referred to statement "We can know more than we can tell" (Polanyi, 1966, p. 4) ignited the discussions of tacit knowledge. In Polanyi's view, knowledge is created as a result of dynamic interaction between focal and subsidiary awareness. Focal awareness constitutes an individual's explicit knowledge, that is, what people initially focus on in performing a practical skill, whereas subsidiary awareness constitutes an individual's tacit knowledge, which is generated subsidiarily using past experiences in the individual's mind and contributes to the understanding and interpreting of current focal awareness. Examples could be playing a piano, playing chess, or hitting a baseball, where knowing the explicit rules does not necessarily give the person the ability to be a piano, chess or baseball player. Polanyi argues that clinical skills are abundant with tacit knowledge (as cited in Henry, 2006; Lane, 2010).

Following Polanyi's work (1966), Nonaka and Takeuchi (1995) expanded the concept of tacit knowledge, describing it as a:

> Highly personal and hard to formalise making it difficult to communicate to others or share with others. Subjective insights, intuitions, and hunches fall into this category of knowledge. Furthermore, tacit knowledge is deeply rooted in an individual's action and experience, as well as in the ideas, values, or emotions he or she embraces. (p. 215)

In addition, Nonaka and Takeuchi (1995) specified two dimensions for tacit knowledge: cognitive and technical. The cognitive dimension refers to an individual's mental models, beliefs, ideas, paradigms, values, and intuition, whereas the technical dimension refers to skills, know-how, crafts, and experience (Haldin-Herrgard, 2000; Leonard & Insch, 2005; Nonaka, 1994). Examples of cognitive tacit knowledge could be how to cook a new dish without using any recipe, how to learn and speak a language, or how to play chess. Technical examples of tacit knowledge can be found in routines, reports and discussions (Haldin-Herrgard, 2000).

Furthermore, Nonaka & Takeuchi (1995) developed a model that explains how knowledge is created and shared through a dynamic interaction between tacit and explicit knowledge. As shown in Figure *2.2*, Nonaka and Takeuchi's knowledge creation model, also known as SECI[2] model, presents four continuous processes for knowledge sharing and conversions from tacit into explicit knowledge and vice versa. These four inter-related processes progress in a spiral fashion from socialisation through externalisation, combination, and internalisation, and return to socialisation again to begin a new process.

- Socialisation describes the conversion of tacit knowledge into a tacit form, involving the creation and exchange of new knowledge through shared experiences, hands-on experience, empathising, and participating in an informal social meeting.
- Externalisation indicates the conversion of knowledge from tacit knowledge to an explicit form, involving crystallising and articulating tacit knowledge into explicit knowledge.

[2] Socialisation, Externalisation, Combination, and Internalisation

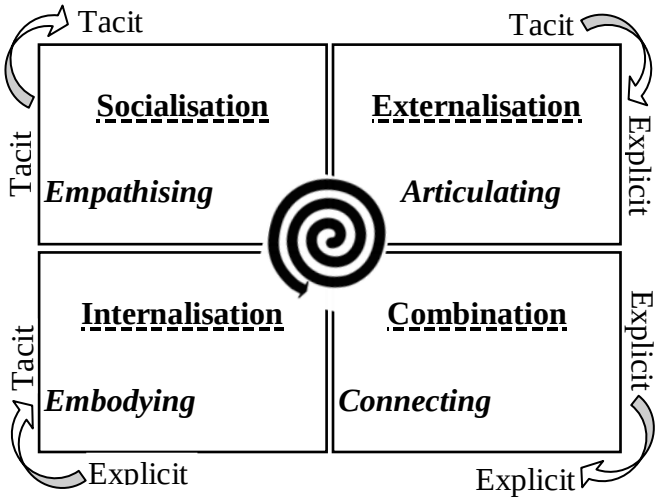

Figure 2.2. SECI model.

Source: Nonaka, Toyama, & Konno, 2000

- Combination is the process of converting explicit knowledge into other systematised explicit knowledge.
- Internalisation deals with the process of converting explicit knowledge into tacit knowledge through reading explicit materials, reflecting upon, applying, and practising that accumulated knowledge in context.

Nonaka and his colleagues (Nonaka & Konno, 1998; Nonaka, Toyama, & Konno, 2000) also updated their model by introducing a different context (*ba*) for each knowledge conversion process: *Ba* is basically a shared context, time, and place in which individuals share their knowledge. According to Nonaka and his colleagues, *ba* is not necessarily limited to only a physical context. It could also be virtual, mental, social, cultural, and historical. Different *ba* might also be connected to constitute a greater *ba*. According to Nonaka and his colleagues, the SECI model takes place in four types of *ba*: originating *ba*, dialoguing *ba*, systemising *ba*, and exercising *ba*.

Originating *ba* offers a context for socialisation where individuals meet face-to-face and share their experiences, mental modes, and emotions. Dialoguing is a *ba* for externalisation in which the individuals' tacit knowledge is articulated and shared with other people through dialoguing at a group level. Systemising (also called cyber *ba*) provides a *ba* for a combination process in which people can manipulate and share their explicit knowledge using common information technology tools. Finally, exercising is a *ba* for internalisation in which people can use virtual media such as written manuals, teleconferences, or simulation programs to embody explicit

knowledge and convert it to tacit knowledge (Nonaka & Konno, 1998; Nonaka, Toyama, & Konno, 2000).

Although Nonaka and his colleagues' recent model acknowledged virtual *ba* for knowledge combination, their model has not addressed the externalisation of tacit knowledge during online real-time chatting, commenting, and discussing. It only addressed the role of information technology in combination (in a systemising *ba*) and internalisation (in an exercising *ba*) processes. However, later studies argued that online virtual communities could also act as a virtual *ba* for externalisation of tacit into explicit knowledge (Curran, Murphy, Abidi, Sinclair, & McGrath, 2009; Hildrum, 2009; Orzano, McInerney, Scharf, Tallia, & Crabtree, 2008; Scott, 1998; Wahlroos, 2010). In other words, while Nonaka and his colleagues' theory is still valid and commonly used, the interpretations of this theory have changed considerably as new technologies have emerged.

The SECI model has also been criticised by some authors who argue that the model is not complete enough. For example, Rodney McAdam and McCreedy (1999) argued that knowledge sharing is more sophisticated than that posited by the SECI model, and that knowledge types could be more than just tacit and explicit. Gourlay (2006) also argued that some of the processes and examples mentioned in the SECI model for knowledge conversions are ambiguous and not supported by sufficient evidence. In addition, he argued that the model did not cover inherently tacit knowledge, a type of tacit knowledge that is not completely expressible. Firestone and McElroy (2003) also believed that Nonaka and Takeuchi oversimplified knowledge conversions in their model.

Despite some criticism, the SECI model is still the most popular and often cited model in the KM and information system (IS) literature. The SECI model probably discusses tacit knowledge sharing in more detail than other knowledge creation frameworks. Other studies seem mostly to replicate the SECI model's arguments. Therefore, this model is considered important for the purpose of this study and it is used as a guide to analyse and interpret the findings of the study.

Following the work of Polanyi (1966) and Nonaka & Takeuchi (1995), many authors have also attempted to extend tacit knowledge definitions and concepts. McAdam et al. (2007, p.45) have characterised tacit knowledge as something "personal, difficult to articulate fully, experience based, contextualised, job specific,

held within, both known and unknown to the holder, transferred through conversation and narrative, and capable of becoming explicit knowledge and vice versa". Yi (2006) also defined tacit knowledge as a personal, difficult to communicate, problematic, and contextual knowledge.

Through a qualitative content analysis of 64 published materials such as journal papers, conference papers and books, Busch (2008) and Busch, Richards, and Dampney (2001) defined tacit knowledge as typically "individualistic", "heavily organisationally based", "directly related to skill" and "context specific". Reviewing the literature, Smith, McKeen, and Singh (2007) also categorised tacit knowledge into best practices, expertise, experience, and innovation.

Murphy, Stapleton, and Smith (2004) identified seven dimensions for tacit knowledge including implicitness, experiential (know-how), interactiveness, show-how (watching, learning by doing/using), context specific, non-measurability, and personal. Chilton and Bloodgood (2010) also introduced four criteria for distinguishing tacit from explicit knowledge: conscious awareness, expressibility, demonstrability, and formal or informal application.

Furthermore, Oguz & Sengün (2011) made a distinction between "tacit knowledge", the term largely used in the organisational literature, and "tacit knowing", the term first used by Polanyi. Polanyi defined "tacit knowing" as a process (in the realm of ontological structure) instead of "tacit knowledge" as a category of knowledge (tacit versus explicit). For Polanyi, "tacit knowing" is procedural in nature, knowing how to do things based on the idea of "dwelling", "the way one dwells with the world as he/she tries to know it" (Oguz & Sengün, 2011, p. 451). Oguz & Sengün (2011) argued that the term "tacit knowledge" used in the organisational literature is closer to Ryle's (1949) view of "knowing-how" than Polanyi's view of "tacit knowing". Table 2.2 presents the differences between "tacit knowing" and "tacit knowledge", as outlined by Oguz & Sengün (2011).

Pure or absolute "tacit knowing", the concept introduced by Polanyi, may not be easily accessible and transferable by IT, as has also been argued by some researchers (Flanagin, 2002; Haldin-Herrgard, 2000; Hislop, 2001; Johannessen, et al., 2001). Therefore, the organisational definition of "tacit knowledge" is probably more applicable to the current research.

Table 2.2

Tacit Knowing Versus Tacit Knowledge

Tacit knowing in Polanyi's view	Tacit knowledge in the organisational literature
- Is not a realm of knowledge - Has an ontological and existential component - Is a process - Is a primary understanding - Is in-dwelling - Is unconscious - Is inexplicable - Is not amenable to well-articulated representation	- Is a knowledge realm - Is the opposite of explicit knowledge - Can be individual or collective - Refers to knowing how and skills - Refers to organisational routines and capabilities - Is contextual - Can complement or substitute explicit knowledge

Source: Oguz & Sengün, 2011

In addition to defining tacit knowledge from different philosophical, psychological, and organisational perspectives, different categorisations of tacit knowledge can also be found. Tacit knowledge is categorised into several types: cognitive and technical knowledge (Nonaka & Takeuchi, 1995); personal and common sense knowledge (Max Boisot, 1998); embodied, embedded, embrained, and encultured knowledge (Blackler, 1995); tacit/implicit and cultural knowledge (Chun Wei Choo, 1998, 2006); individual and social/collective implicit knowledge (Spender, 1996); articulable and inarticulable tacit knowledge (Busch, 2008; Busch, et al., 2001); and inherently and contingently tacit knowledge (Stephen Gourlay, 2006).

Despite various definitions and considerable discussion regarding tacit knowledge, defining tacit knowledge and its boundaries is still debated in the literature (Toom, 2012; Venkitachalam & Busch, 2012). As the definitions above show, the concept of tacit knowledge is complex and multifaceted in the literature and different fields of study understand tacit knowledge differently. It is not yet clearly known how long tacit knowledge remains tacit, or when it can be said that it is no longer tacit, or to what extent it can be articulated, or what types of tacit knowledge exist, or whether all documented knowledge is really explicit and does not include any tacit components (Venkitachalam & Busch, 2012).

Because of these topics of debate in the literature, many researchers currently intend to view knowledge as a continuum of tacit-to-explicit knowledge rather than a dichotomy of tacit vs. explicit knowledge (Chennamaneni & Teng, 2011; Haldin-Herrgard, 2000; Jasimuddin, et al., 2005). In other words, knowledge has been

regarded as a continuum which starts from completely tacit and ends as totally explicit (Haldin-Herrgard, 2000). Researchers (Ambrosini & Bowman, 2001; Cavusgil, Calantone, & Zhao, 2003; Chennamaneni & Teng, 2011; Jasimuddin, et al., 2005; Lahti & Beyerlein, 2000; Ruff & Wilson, 2003) also argue that tacit knowledge can be categorised based on the degree of tacitness, with parts of tacit knowledge having a low or medium degree of tacitness and which might be articulated and shared if the appropriate mechanisms are used.

By adopting Busch's (2008) categorisation of tacit knowledge into articulable and inarticulable tacit knowledge, and by collecting examples of these two types of tacit knowledge and also explicit knowledge, a continuum of tacit to explicit knowledge was developed for the study. Figure 2.3 shows the continuum of tacit to explicit knowledge with examples from the literature of both tacit and explicit knowledge.

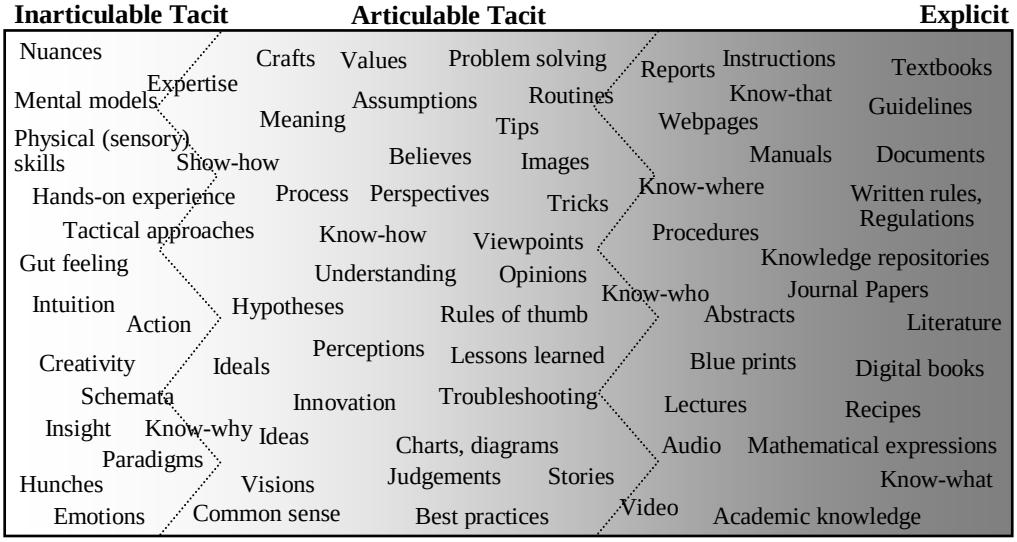

Figure 2.3. The tacit-explicit continuum with examples collected from the literature.

Sources: Chua, 2001; Hau & Evangelista, 2007; Lample, Squire, & Johnsrud, 2004; Nonaka, 1994; Nonaka, Toyama, & Nagata, 2000; Qiu, Chui, & Helander, 2008; H. Smith, et al., 2007; Tiwana, 2002; F. K. Wang, 2006; A. Willem & Buelens, 2007; Yahya & Goh, 2002; etc.

The inarticulable tacit knowledge (also called true or inherently tacit knowledge) is defined by Busch (2008, p. 451) as a "subset (whether major or minor) of tacit knowledge that cannot be truly articulated". This definition is closer to Polanyi's (1966) concept of "indwelling" in things and incorporating them into the body as a way of knowing and obtaining skills to perform a particular practice such as riding a bike or playing a musical instrument. The inarticulable tacit knowledge is

very difficult to transfer since it is primarily based upon personal physical experience, sensing, and feeling, and hence may not be easily verbalised and shared.

On the other hand, articulable tacit knowledge (also called implicit or contingent knowledge) is a "subset (whether major or minor) of tacit knowledge that can eventually be articulated" (Busch, 2008, p. 450). This type of tacit knowledge has a low or medium degree of tacitness and might be crystallised, articulated, and shared if the right person is asked and if the appropriate mechanisms are used for sharing this knowledge. Examples of articulable tacit knowledge could be tips, tricks of the trade, professional opinions, new ideas, and demonstrable skills that could be shared to some extent.

Articulable tacit knowledge, rather than inarticulable tacit knowledge, is the focus of many organisational studies. It is also adopted as a working definition of tacit knowledge for the purpose of this study. This definition and examples as shown in Figure 2.3 are constantly used as a guide in the data analysis and also in the interpretations of the data in this study.

2.4 THE IMPORTANCE OF TACIT KNOWLEDGE IN CLINICAL WORK

Tacit knowledge has been analogised as an invisible underlying part of an iceberg which encompasses the largest part of human knowledge compared to the visible explicit knowledge (Haldin-Herrgard, 2000). Polanyi (1966), who first proposed the term "tacit knowledge", also highlights that all explicit human knowledge builds upon tacit knowledge which is critical for problem solving and creating new knowledge (as cited in Henry, 2006). Hicks, Dattero, and Galup (2007) also used a metaphor of "explicit islands in a tacit sea" to explain the importance of tacit knowledge.

The main objective of KM is to facilitate tacit knowledge acquisition and sharing among individuals (Bollinger & Smith, 2001; Kebede, 2010; Saeed Mirza, 2009; Yang, 2006). McDermott (2000) considers that the "real gold" in KM activities is not in disseminating ready-made explicit knowledge, but in sharing tacit knowledge such as ideas, insights, experiences, personal opinions, and beliefs. Penciuc et al. (2010) also acknowledge that loss of tacit knowledge within an organisation leads to the loss of a certain amount of its main assets, that is, its "collective memory". In general, transferring tacit knowledge is perceived as an

important factor in improving the quality of work, efficiency of decision making, organisational learning, productivity, competitiveness, customer service, production of goods, and accuracy of task performance, and in making major time saving for individuals and organisations (Haldin-Herrgard, 2000; M. H. Selamat & Choudrie, 2004; Wahab, et al., 2010).

Furthermore, capturing and facilitating tacit knowledge sharing among employees along with exploiting existing explicit knowledge has been argued to be the two top priorities for the most organisations today (Quintas, 2002). This is particularly important in healthcare organisations as patient care is very complex and challenging, requiring more tacit decisions and explicit knowledge consumption (Steininger, et al., 2010). According to Bate and Robert (2002), finding appropriate ways to encode and transfer healthcare professionals' tacit knowledge within and sharing between organisations is a major issue for future quality improvement initiatives in healthcare organisations. Abidi (2005) also stresses that capturing, formalising, measuring, addressing, and operationalising healthcare tacit knowledge is one of the main issues of healthcare KM in the information era.

Healthcare organisations can be defined as highly tacit knowledge environments where both tacit and explicit knowledge is critical for the quality and delivery of patient care (Abidi, et al., 2005; Jean, et al., 2003; Saeed Mirza, 2009). The importance of tacit knowledge in the healthcare industry is well recognised and documented (Abidi, et al., 2005; Engel, 2008; Fox, 1997; Friedman & Bernell, 2006; Greenhalgh, et al.; Henry, 2006; Kontos & Naglie, 2009; Steininger, et al., 2010). For instance, Steininger et al. (2010) stated that the complexity of finding the right treatment for patients makes tacit knowledge of medical practitioners more significant than their explicit knowledge. Oborn-Barrett and Dawson (2005) also regarded tacit knowledge of healthcare practitioners as a core medical knowledge that gives sense to medical information. In addition, it is argued that most medical decisions and diagnostic processes are being made on the base of tacit knowledge (Henry, 2006; Paavola, et al., 2005; Steininger, et al., 2010).

Importantly, the tacit knowledge of healthcare professionals is the most valuable source of their "experiential know-how" and is related to their clinical experiences in vital situations (Abidi, et al., 2005). It is about "*what really works and how to make it work*" rather than explicit knowledge of "*how things should work*"

(Abidi, et al., 2005, p. 194, italics in original). Tacit knowledge is omnipresent in every part of healthcare settings in the form of "the working knowledge of health-care experts", "the social knowledge ingrained in collaborative problem-solving", "educational discussions between healthcare practitioners", "the communication patterns between a community of practitioners leading to the manifestation of an expert network", and even in "clinical episodes recorded in electronic patient records" (Abidi, et al., 2005, p. 193). Table 2.3 shows examples of tacit knowledge identified in the healthcare context.

Table 2.3

Examples of Tacit Knowledge in Healthcare Context

Example	Source
Nurses' intuitions about patients' conditions	Herbig et. al. 2001; Josefson 1988; Leonard & Sensiper 1998, as cited in Gourlay, 2004
Using surgical instruments	Goldman, 1990
Surgeon's knowledge of the precise amount of tension to exert upon a suture	Goldman, 1990
Tacit judgement and diagnostic interpretation of X-ray images by an expert radiologist	Goldman, 1990; Polanyi, 1966
Physicians' understanding of a patient's situation to generate accurate diagnoses	Hurst, 2010
Using a stethoscope by anaesthetists	Kraal & Popovic, 2010
Doctors' rules of thumb for psychosocial problems	André et. al. 2002, as cited in Gourlay, 2004
Ultrasonographer's interpretation of sonograms	Henry, 2006
Influence of tacit knowledge on performance of cardiothoracic surgery teams	Friedman & Bernell, 2006
Nurses' tacit knowledge in the decision-making process of care regarding patients with pressure sores	Carroll, 1988
Most laboratory skills	Addis, Gooding, & Townsend, 1993

One of the important findings of tacit knowledge studies in the healthcare domain is that sharing tacit knowledge considerably enhances the quality of decisions and diagnoses made by clinicians (Engel, 2008; Greenhalgh, et al., 2008; Henry, 2006; C. Lin & Chang, 2008; Paavola, et al., 2005; Steininger, et al., 2010). For example, Lin and Chang (2008) found that among different types of knowledge, sharing of tacit knowledge, such as skills, know-how, clinical experience, know-whom, and experiences obtained in physician-patient relationships, has a significant impact in improving the quality of clinical decision making. Similarly, Engel's

(2008) study confirmed that clinical judgments are affected predominantly by clinicians' tacit knowledge.

In addition, Patel, Arocha, and Kaufman (1999) found that while medical researchers prefer to apply detailed basic science in solving clinical cases, clinical practitioners employ more context-based tacit knowledge than basic explicit science. Greenhalgh et al. (2008) also discovered that there is a sophisticated relationship between using tacit and explicit knowledge in clinical decision making. Furthermore, Abidi et al. (2005) argued that medical literature is not always sufficient for clinical decision making and that such decisions are often made on the basis of tacit knowledge. Henry (2006) also viewed tacit knowledge as an important part of medical knowledge and clinical judgments which clinicians heavily rely on. Paavola et al. (2005) also emphasised that clinicians use more tacit than explicit knowledge in their decision making and diagnostic processes. They argued that utilising IT initiatives that simulate real-world situations and facilitate open communication can enhance the process of tacit knowledge sharing among medical experts.

Strategically, tacit knowledge has also been observed as a critical asset in improving the performance of cardiac surgery teams (Friedman & Bernell, 2006). Nurses also rely on using tacit knowledge for effective clinical practice (Carroll, 1988; Fox, 1997). Welsh and Lyons (2001) found that the tacit knowledge of experienced nurses is essential in assessing patients with complex mental problems. Nurses use tacit knowledge not only in their everyday clinical practice but also in their information seeking practice. Verhoeven, Steehouder, Hendrix, and van Gemert-Pijnen (2010) suggest that this information seeking behaviour of clinicians should be considered in designing and developing communication tools for healthcare practitioners.

In summary, prior research has highlighted the importance of tacit knowledge sharing in the healthcare setting by regarding it as one of the important factors that influence the quality of clinicians' decision-making processes during clinical encounters. It has been viewed as an essential asset in improving the quality of patient care. Consequently, from a healthcare KM perspective it is necessary to harness and facilitate tacit knowledge sharing among clinical teams who may not always physically co-located but must exchange their experiential knowledge (Abidi,

et al., 2005). However, the mechanisms, channels, and technologies required to achieve this are different, and are subject to disagreement.

Healthcare organisations are always looking for the better ways to make their clinicians' knowledge more accessible (C. Lin & Chang, 2008). It is argued that the typical KM technologies are not suitable for tacit knowledge sharing (Haldin-Herrgard, 2000). To achieve this goal, technologies are needed that facilitate social interaction and open up communication among healthcare professional groups (McDermott, 2000; Paavola, et al., 2005).

2.5 TACIT KNOWLEDGE SHARING

The conceptualisation of tacit knowledge sharing has always been a subject of debate for researchers. There are two main schools of thoughts regarding tacit knowledge sharing (Stephen Gourlay, 2006; McAdam, et al., 2007): The first group mainly follows Polanyi's (1966) view and believes that tacit knowledge is highly personal and resides only in human minds, and therefore it would be very difficult to share such knowledge using formal methods. This group argues that tacit knowledge can only be shared or learned in a tacit form through personal experience, apprenticeship, observation, and imitation. In the view of this group, most tacit knowledge is inexpressible and when it is articulated then it is no longer tacit.

On the other hand, the second group, who predominantly follows the perspectives of Nonaka and his colleagues, believes that parts of tacit knowledge (if not all of it) can be converted to explicit knowledge and therefore can be somewhat shared. This group not only admits the arguments of the previous school of thoughts that tacit knowledge can be shared in a tacit form through personal experience, apprenticeship, observation, and imitation, but it also believes that tacit knowledge can be externalised and converted to explicit knowledge through dialogue, social interaction, and storytelling (Stephen Gourlay, 2006; McAdam, et al., 2007).

Despite the different views about tacit knowledge sharing, there is an agreement among researchers that sharing tacit knowledge is more difficult than sharing explicit knowledge (McAdam, et al., 2007). Different mechanisms and enabling conditions are required for tacit knowledge sharing. Although a great deal of the literature has been dedicated to identifying how tacit knowledge might be shared and what mechanisms could be employed to crystallise, externalise, and share

it, most studies just seem to replicate Polanyi's (1966) and Nonaka and his colleagues' (Nonaka & Takeuchi, 1995; Nonaka, Toyama, & Konno, 2000) arguments about tacit knowledge sharing.

In an effort to identify how tacit knowledge sharing might be captured and shared, a comprehensive review was conducted by the researcher in KM literature using a content analysis approach. The purpose was to identify a list of mechanisms and enabling conditions that mediate tacit knowledge sharing among individuals. The identified factors might provide insights that lead to a better understanding of the phenomenon of tacit knowledge sharing in a social media context, and how social media may support some of the mechanisms of tacit knowledge sharing.

To conduct the content analysis, first, a prospective set of articles was drawn up by searching popular KM online databases such as ProQuest, Ebsco-Host, Emerald, Web Of Science, Elsevier, ScienceDirect, and Google Scholar/Books (Lam & Chua, 2005). A search query was constructed according to the purpose of the analysis, using keywords and synonyms obtained from known primary studies. Search strings were formulated using Boolean operators. Following is an example of a search query used in the search of databases.

> (Tacit OR implicit) AND knowledge AND (sharing OR transfer OR exchange OR dissemination) AND (mechanism(s) OR method(s) OR way(s) OR technique(s)

In searching databases**,** no time and geographical limitations were imposed; however, a language limitation (English) was applied to the selected articles. The search was not restricted to a particular type of publication to increase the scope of search. In other words, the search strategy was to target all journal papers, reviews, book chapters, conference papers, and postgraduate theses. In addition to keyword searching, backward and forward searching (Levy & Ellis, 2006) have also been employed at times. In other words, references cited by collected papers were also reviewed to see if there was any relevant case for analysis.

To ensure the quality of papers, cases having less academic rigour (not published in peer-reviewed scholarly publications) or having inadequate discussion of the topic of the review (papers which only cited results of other works, or just briefly touched the topic without providing empirical or theoretical support) were

discarded from the sample. Finally, one hundred articles were chosen for the analysis. Initially, exact statements of authors, which had explicitly or implicitly stated some mechanisms and conditions for tacit knowledge capturing and sharing, were collected and summarised in a table (see Appendix A). Then, those which were close in meaning were combined. A summary of these findings is presented below.

> *Trust **(39)**, Frequent informal communication (face-to-face or virtual) **(35)**, Personal experiences (hands-on experience, learning by doing, practice) **(32)**, Social interaction, socialisation **(31)**, Networking (Informal relationship, close personal and interpersonal contact, intimacy) **(31)**, Mentoring/apprenticeships **(30)**, Social networks- community of practices **(29)**, Storytelling (narratives) **(26)**, Collaboration **(18)**, Rich Media-multimedia objects, video conferencing **(17)**, Sharing experiences **(16)**, Learning by observation and watching **(16)**, Informal dialogue/conversation **(16)**, Use of metaphors, analogies and models **(15)**, Questioning (asking, probing, interviewing) **(12)**, Learning opportunities such as study missions, on the job training, tours, workshops, knowledge fairs **(12)**, Proximity, concurrency, co-presence **(11)**, Access to experts (experts locating) **(11)**, Spending time together **(9)**, Reflecting on practice **(9)**, Discussions sessions **(9)**, Simulation, modelling, and experimentation **(8)**, Climate of openness **(7)**, Imitations (mimicking behaviour) **(6)**, Demonstrations (show-how) **(5)**, Brainstorming **(5)**, Active & guided participation **(5)**, Post-project review (debriefing) **(4)**, Non-verbal communication, emotion **(4)**, Lessons learned or best practice exercise, benchmarking **(4)**, Documentation of experiences **(4)**, Knowledge visualisation, Drawings **(3)**, Joint activities and problem solving **(3)**, Writing memos **(2)**, Incidental learning **(2)**, Immediate feedback **(2)**, Co-authorship **(2)**, Trial and error **(1)**.*
>
> ***Note:*** The numbers indicates how many sources mentioned each factor. The sources are listed in Appendix A.

In total, thirty-eight mechanisms and enabling conditions were identified from the literature that could be helpful in tacit knowledge capturing and sharing. Discussing all these factors is beyond the scope of this study. However, examples of those factors that potentially might be applicable in the context of the current study (social media contribution to tacit knowledge), and were cited extensively in the literature, will be discussed in Section 2.8, in which the viability of social media for tacit knowledge sharing is discussed.

2.6 IT AND TACIT KNOWLEDGE SHARING

There is a major debate ongoing among researchers about whether information technology can have a role in tacit knowledge sharing among individuals. Some, particularly those who conducted their study before the introduction of social web tools, insist that tacit knowledge sharing through using IT is too limited if not absolutely impossible to achieve (Flanagin, 2002; Haldin-Herrgard, 2000; Hislop, 2001; Johannessen, et al., 2001). Others argue that IT can partially facilitate tacit knowledge sharing although it may not be as rich as face-to-face interactions (Alavi & Leidner, 2001; Chatti, et al., 2007; Falconer, 2006; R. Harris & Lecturer, 2009; Hildrum, 2009; Lopez-Nicolas & Soto-Acosta, 2010; Marwick, 2001; Murray & Peyrefitte, 2007; Sarkiunaite & Kriksciuniene, 2005; M. H. Selamat & Choudrie, 2004; Stenmark, 2000). Each school of thought has its own justifications and explanations.

The proponents of the first school of thought implicitly/explicitly are advocates of viewing knowledge as a category, absolutely tacit or absolutely explicit (Hislop, 2001; Johannessen, et al., 2001; Mohamed, Stankosky, & Murray, 2006). They believe that the nature of tacit knowledge as highly personal knowledge that resides in human brains makes it impossible to be shared not only by language but also through IT. They view tacit knowledge as that which is not expressible and articulable by using common language or even that which is not always accessible to the holder of knowledge. In the view of this school, this type of knowledge can only be acquired through personal experience at the workplace and can only be shared as tacit without even being converted to explicit. It can only be shared through active and direct communication, mechanisms such as observing, mentoring, apprenticeship, mutual involvement, participation, storytelling, and so on. Therefore, this school considers that IT only has a minimal role in tacit knowledge capturing and sharing. For example, Johannessen et al. (2001) assert that tacit knowledge cannot be digitalised and shared by means of the Internet, E-mails, or group-ware applications.

In contrast, the second school of thought admits that IT can contribute to tacit knowledge sharing, although this may not be as rich as face-to-face tacit knowledge sharing. This school views knowledge as being on a continuum that can have different degrees of tacitness (Chennamaneni & Teng, 2011; Jasimuddin, et al.,

2005). In the perspective of this school of thought, IT can easily facilitate sharing of knowledge with a low to medium degree of tacitness and fairly support sharing of knowledge with a high degree of tacitness. In addition, based on Nonaka and Takeuchi's (1995) knowledge creation theory, the proponents of this view assert that tacit knowledge sharing not only includes tacit-to-tacit conversion (socialisation) but also tacit-to-explicit (externalisation) and explicit-to-tacit (internalisation) conversions, too (Lopez-Nicolas & Soto-Acosta, 2010; Marwick, 2001; Sarkiunaite & Kriksciuniene, 2005). Furthermore, Nonaka and his colleagues (Nonaka, Toyama, & Konno, 2000), in an update to their original model, stressed that knowledge conversions can take place in a virtual *ba* (space) too. In other words, they believe in the possibility of tacit knowledge sharing with ICT support.

The proponents of IT-mediated tacit knowledge sharing demonstrate that IT can facilitate tacit knowledge sharing processes through supporting various conversions of tacit-explicit knowledge, although it may not be as rich as face-to-face interactions. IT can support tacit knowledge creation and sharing by providing a field in which people freely express their personal new ideas, perspectives, and arguments; by establishing a positive dialogue among experts; and by making information more available and then enabling people to arrive at new insights and better interpretations (Alavi & Leidner, 2001). For instance, Stenmark (2000) argues that tacit knowledge sharing is not outside the reach of IT support. He suggests that instead of trying to capture and manage tacit knowledge, IT solutions should be designed to provide an environment in which experts can be located, communicate with each other, and sustain social interactions. The results of this social interaction over IT will be a better flow and exchange of tacit knowledge. Falconer (2006) also, by providing evidence from IT and e-leaning research domains, refutes previous studies asserting that tacit knowledge sharing cannot be facilitated by IT and strongly emphasises the significant potential of IT in effective communication of tacit knowledge.

The knowledge creation model (also called SECI model) developed by Nonaka and Takeuchi (1995) has been the theme of several research articles studying the role that IT plays in knowledge sharing (Chatti, et al., 2007; Lopez-Nicolas & Soto-Acosta, 2010; Marwick, 2001; Sarkiunaite & Kriksciuniene, 2005). Nonaka and Takeuchi's SECI model presents four types for knowledge conversions: socialisation

(tacit to tacit), externalisation (tacit to explicit), combination (explicit to explicit), and internalisation (explicit to tacit). Three of these conversions, socialisation, externalisation, and internalisation, are the main processes of tacit knowledge sharing (Sarkiunaite & Kriksciuniene, 2005). Some researchers attempted to make a link between existed IT tools and tacit knowledge conversions by using the SECI model (see Table 2.4).

Table 2.4

Mechanisms and Technologies suggested for Knowledge Creating and Sharing (Face-to-face versus ICT-mediated)

Face-to-face		**ICT assisted**	
Socialisation (tacit to tacit)	Externalisation (tacit to explicit)	Socialisation (tacit to tacit)	Externalisation (tacit to explicit)
Team meetings - Discussions - Interpersonal interaction - Apprenticeship - Participation - Observation	- Dialog with team - Answering questions - Storytelling - Metaphors/analogies	- Online real-time meetings - Synchronous communication (Chat) - Online community of practice - Groupware systems - Web 2.0 tools	- Answering questions - Annotations - Blogs/wikis - Discussion forums - Collaborative systems - Groupware systems - Phone/video conferencing
Combination (explicit to explicit)	Internalisation (explicit to tacit)	Combination (explicit to explicit)	Internalisation (explicit to tacit)
- Books - Papers - Reports - Presentations - Indexes etc.	- Learning by doing - Learning from books, reports, presentations, and lectures.	- All forms of technology - Text search - Document categorisation - Podcast/vodcast - Blogs/wikis - RSS - Mashups	- Visualisation - Video/Audio presentations - Online learning - E-mail - Webpage

Adapted from: Chatti, et al., 2007; Marwick, 2001; Sarkiunaite & Kriksciuniene, 2005

Marwick (2001) considers that the contribution of traditional IT to tacit knowledge sharing was less efficient than face-to-face communications, and that traditional IT was more suitable for explicit knowledge sharing than tacit knowledge sharing. However, he expected that gradual progress in accommodating the human dimension in the development of new tools such as synchronous collaboration systems, expertise locators, discussion forums, and high bandwidth video-conferencing will contribute to the formation and communication of tacit knowledge much better than before. This is where current social web tools might be partially helpful and need further study.

Lopez-Nicolas and Soto-Acosta (2010) also found that ICT can influence all the knowledge creation processes identified in the SECI model. Their study shows that IT can affect the socialisation of knowledge by facilitating interactions among individuals; the externalisation process by developing community-based electronic discussions and chat rooms; the combination process by supporting sorting, adding, combining, and categorising existing information; and finally that IT can support the internalisation process by facilitating informal conversations and discussions, and making the information more available. Although they found limited evidence for the support of socialisation and externalisation processes through the use of ICT, they recommend further studies to examine the interplay of different types of ICT for tacit knowledge sharing. Sarkiunaite & Kriksciuniene (2005), also by using the SECI model, generalise that a high level of IT use positively affects informal relationships between individuals, which in turn facilitates job-related tacit knowledge sharing.

Of the schools of thoughts discussed above, the perspectives of the second school (the proponents of IT-mediated tacit knowledge sharing) seem more reasonable and acceptable than those of the first school. Knowledge cannot be regarded as a binary digit (0 or 1), that is, as pure tacit knowledge or pure explicit knowledge. The notion of the "degree of tacitness" or "the degree of explicitness" is more meaningful when examining knowledge processes in a specific context (Chua, 2001). In addition, constraining tacit knowledge sharing to tacit-tacit conversion (socialisation) may not allow a thorough examination of the tacit knowledge sharing phenomenon through IT assisted communications. Every type of knowledge (including explicit knowledge) has components of a tacit dimension (Hislop, 2001; Polanyi, 1966). Therefore, every tacit-tacit as well as tacit-explicit conversion and vice versa could be regarded as a tacit knowledge sharing phenomenon (Lopez-Nicolas & Soto-Acosta, 2010; Marwick, 2001; Sarkiunaite & Kriksciuniene, 2005). This is what is missed in most investigations of IT-facilitated tacit knowledge sharing.

Also to be considered in investigations of IT-assisted tacit knowledge sharing is the differences that exist between "tacit knowledge" and "tacit knowing". As discussed above in the context of the definition of tacit knowledge, "tacit knowledge", the term used in the organisational literature, and "tacit knowing", the term first used by Polanyi, are somehow different (Oguz & Sengün, 2011).

Considering the differences between "tacit knowing" and "tacit knowledge" outlined by Oguz & Sengün (2011), obviously "tacit knowing", the knowledge with a high degree of tacitness, is not easily accessible and transferable by IT. This has been shown by many of the researchers belonging to the first school of thought in the past. Therefore, as discussed above, the organisational definition of "tacit knowledge" is more applicable to research on IT for tacit knowledge sharing.

Apart from the theoretical issues discussed above, there are also practical issues in tacit knowledge sharing. For example, it is argued that face-to-face communication is no longer the principal way of tacit knowledge sharing, particularly when experts are not always geographically co-located, but must change their experiential tacit knowledge. Therefore, today the use and optimisation of IT for facilitating tacit knowledge sharing is almost inevitable (Sarkiunaite & Kriksciuniene, 2005). IT certainly can enable individuals to share their tacit knowledge (particularly knowledge with a low or medium degree of tacitness) by providing better mechanisms for processing, delivery and exchanging of their valuable knowledge as well as by building an environment that allows experts to locate each other and socially interact about job-related issues (Falconer, 2006; Marwick, 2001; M. H. Selamat & Choudrie, 2004).

Researchers have suggested a variety of IT tools for facilitating tacit knowledge sharing, ranging from communication tools (e.g. instant messaging and discussion forums) to collaborative systems, multi-media sharing tools, video conferencing, online communities, and Web 2.0 tools such as blogs, wikis, and social networks (Ardichvili, et al., 2003; Davidaviciene & Raudeliuniene, 2010; R. Harris & Lecturer, 2009; Hildrum, 2009; Khan & Jones, 2011; I. L. A. Lai, 2005; Marwick, 2001; M. Mayfield, 2010; Mitri, 2003; G. Murphy & Salomone, 2012; Murray & Peyrefitte, 2007; Nilmanat, 2011; Parker, 2011; E. A. Smith, 2001; D. Song, 2009; Wan & Zhao, 2007; Yi, 2006). However, few of these studies have empirically investigated the potential of current social media tools such as Facebook, YouTube, and Twitter in facilitating tacit knowledge sharing.

2.6.1 Difficulties of tacit knowledge sharing through IT

Researchers have addressed several theoretical, individual, cultural, and technical difficulties regarding tacit knowledge sharing. For instance, Haldin-Herrgard (2000) noted five difficulties in sharing tacit knowledge: perception

(unconsciousness of the tacit knowledge); language (difficulty of expressing and verbalising tacit knowledge); time (length of time required to process and internalise new knowledge); value (immeasurable value of some kind of tacit knowledge); and distance (the need for face-to-face interaction). Hislop (2003) also highlighted that the embodied nature of tacit knowledge and its embeddedness in social and cultural values make it more difficult to be successfully shared. However, he agrees that the degree of tacitness is the most significant factor influencing tacit knowledge sharing mediated by IT. Inherent elusiveness of tacit knowledge, not being aware of holding some kinds of tacit knowledge by individuals, unwillingness to share, fear of losing that valuable knowledge and eventually losing competitive advantage are other issues mentioned by Stenmark (2000) of relevance in tacit knowledge sharing.

Some of the difficulties mentioned above relate to personal or organisational ability and willingness to share tacit knowledge, which is not the focus of this paper. Factors which are mainly applicable to ICT-mediated tacit knowledge sharing are more of interest to this study, and these are discussed below.

Sharing mechanisms. Tacit knowledge is conceptualised as personal knowledge that is deeply embedded in an individual's mind, her/his action, experience, and involvement in a particular context (Nonaka, 1994). Therefore, transferring and sharing this unstructured, uncoded knowledge is not as simple as transferring and sharing explicit, coded knowledge (Jasimuddin, et al., 2005; Yang & Farn, 2009). To capture and share this knowledge, mechanisms other than language such as face-to-face interaction, observing, mentoring, personal experience, and so on are more appropriate. As discussed in the previous section, this perspective has affected most of the opponents of ICT-facilitated tacit knowledge sharing (Hildrum, 2009). Although face-to-face contact is the ideal way to share tacit knowledge it is not always possible as people simply do not have access to experts or their colleagues all the time.

In addition, face-to-face interaction is not the singularly important way of tacit knowledge exchanging that it is sometimes made out to be. There are other ways of tacit knowledge sharing which are important and feasible by employing IT, such as demonstration (or imitation) of skills through the use of videos, storytelling and sharing practical day-to-day experience, developing technical discussions using ICT, and so on (Hildrum, 2009). Furthermore, as already discussed, if tacit knowledge

sharing is viewed as not only tacit-to-tacit but also tacit-to-explicit and explicit-to-tacit conversions (Lopez-Nicolas & Soto-Acosta, 2010; Marwick, 2001; McDermott, 1999; Sarkiunaite & Kriksciuniene, 2005) it could be argued that each of these conversions can be facilitated by using different mechanisms. Tacit-to-tacit conversion (socialisation), particularly in the case of sharing knowledge with a high degree of tacitness, may need more face-to-face communication than other phases of tacit-explicit conversions such as externalisation or internalisation which could be easily facilitated with the help of ICT.

Degree of tacitness. The degree of knowledge tacitness is a controversial issue and affects individuals' ability to share their tacit knowledge. Researchers have argued that the tacit-explicit dichotomy of knowledge may not be appropriate. They advocate viewing knowledge as a continuum rather than as a single category (Ambrosini & Bowman, 2001; Cavusgil, et al., 2003; Chennamaneni & Teng, 2011; Jasimuddin, et al., 2005; Lahti & Beyerlein, 2000; Ruff & Wilson, 2003). For example, Ambrosini & Bowman (2001) propose that tacit knowledge can be different in terms of the degree of tacitness.

As shown in Figure *2.4*, tacit knowledge might encompass the following: A: too deeply ingrained tacit skills with the highest degree of tacitness, which may be totally unavailable to the knower; B: imperfectly articulated tacit skills that cannot be articulated through the normal use of words and may be accessed through the use of metaphors and storytelling; C: readily articulated tacit skills which are primarily unarticulated but could be expressed readily if individuals were simply asked the right questions; and D: explicit skills with the lowest degree of tacitness which can easily be articulated and transferred using any knowledge sharing mechanisms.

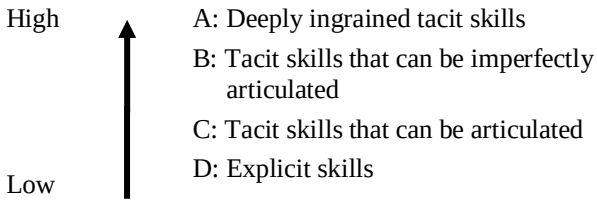

Figure 2.4. Degree of tacitness.
Source: Ambrosini & Bowman, 2001

In addition, Chennamaneni and Teng (2011) assert that tacit knowledge can be ranged from low to high. They conclude that knowledge with a low to medium degree of tacitness can be shared if appropriate knowledge sharing mechanisms are

used. Furthermore, the degree of knowledge tacitness might be variable from person to person. It could be tacit for one person while at the same time the same knowledge could be explicit for another person.

Richness of media and issue of social cues. Social interaction is the main prerequisite for tacit knowledge sharing (Nonaka & Takeuchi, 1995; Polanyi, 1966; D. Song, 2009; Yang & Farn, 2009). Social interaction is richer when media support natural language, immediate feedback, social cues, and social presence for both sender and receiver of message (Chua, 2001; Daft & Lengel, 1986). IT can support this richer interaction by real-time synchronous communication in the form of spontaneous chatting, commenting, video and text based conferencing, and so forth (Marwick, 2001). However, IT support is not as rich as face-to-face meetings so far (Marwick, 2001; Murray & Peyrefitte, 2007). Missing certain social cues such as body language, emotional feelings, and eye contact are argued to be major shortcomings of most computer-aided communications (Hislop, 2001; Hooff & Weenen, 2004).

There is no doubt that IT-facilitated communication is so far not as rich as face-to-face contact. However, social cues and direct face-to-face communication are more important when the knowledge shared contains a high degree of tacitness (Chennamaneni & Teng, 2011). For knowledge with a low to medium degree of tacitness people prefer to use existing technologies to overcome geographical distance, time, and cost barriers (Gordeyeva, 2010). In addition, with the advent of high bandwidth connections and video conferencing technologies which resemble face-to-face interaction, most caveats concerning IT richness in tacit knowledge sharing are likely to diminish (Lopez-Nicolas & Soto-Acosta, 2010).

Lack of trust. Trust is regarded as one of the essential factors for tacit knowledge sharing (Castelfranchi, 2004; Holste & Fields, 2010; I. L. A. Lai, 2005; D. Song, 2009; Yang & Farn, 2009). Potential lack of past or future associations and eventually lack of trust among users is viewed as one of the major issues for tacit knowledge sharing in computer-mediated communications. Building online communities and increasing communication among individuals is suggested as one solution to increase trust among individuals (Raisanen & Oinas-Kukkonen, 2008). On the other hand, anonymous sharing is viewed as a positive aspect of virtual

knowledge sharing where tacit knowledge is risky or when people are not confident to share their knowledge publicly (Raisanen & Oinas-Kukkonen, 2008; Yi, 2006).

The solution to most of these deficiencies proposed by some researchers is to create a positive online social environment for interpersonal interactions and knowledge sharing (Sarkiunaite & Kriksciuniene, 2005). However, there are also other issues associated with virtual tacit knowledge sharing such as separation, lack of psychological safety, lack of social obligation to give feedback, lack of shared language and understanding (McKenzie & Potter, 2004).

2.6.2 Online tacit knowledge sharing-selected studies

This section provides examples of studies which are mainly focused on tacit knowledge sharing in online environments. The purpose is first to show that tacit knowledge sharing occurs in online environments, and then to demonstrate an existing research gap which will be discussed later in the discussions of literature findings. The following are examples of studies which have explored tacit knowledge sharing in online space.

Hara and Hew (2007) in their case study of an online community of healthcare providers discovered that the most important activity that nurses undertake in online communities is associated with practical tacit knowledge – including institutional practices, personal opinions and suggestions. Their study focuses more on the type of knowledge and the factors (individual, social, and technological) that help to sustain knowledge sharing within a community of practice (CoP). The IT contribution to this was not adequately addressed in their research except for the asynchronicity feature of technology. They suggest for further studies of other online communities.

Yi (2006) compared the strengths and weakness of both face-to-face and online externalisation of tacit knowledge. She suggested that there is a need for further studies to investigate online externalisation of tacit knowledge by examining different types of online tools and environments. Hildrum (2009) challenged the traditional arguments that ICT is unable to facilitate tacit knowledge sharing. By conducting a case study in Cisco's network of partner firms, he showed that interpersonal tacit knowledge sharing can happen with novel Internet-based applications such as online social networks, CoPs, and e-learning technologies which connect technicians all over the world.

Curran et al. (2009) studied the practice of knowledge seeking and sharing among rural and urban clinicians in a virtual community of emergency practice providers. Using content analysis of discussion boards followed by a questionnaire, they found that the majority of clinicians in online communities were interested in the practice of their peers in order to benchmark best practices. They concluded that online social networks can be an important place for sharing personal or collective experiential knowledge as well as explicit types of knowledge in the healthcare setting, particularly where resources are limited (e.g. in rural and urban emergency settings).

Orzano et al. (2008) acknowledged that tacit knowledge sharing is better facilitated by employing social tools which facilitate interaction and socialisation among individuals. Chatti et al. (2007) viewed social media and other Web 2.0 tools as an ideal fit with Nonaka's SECI knowledge creation theory, facilitating all socialisation, externalisation, combination, and internalisation processes. Nilmanat (2011) analysed the contents of discussion threads in an online community in order to show tacit knowledge exchange through image sharing. Finally, Chennamaneni and Teng (2011) linked communication media, particularly Web 2.0 tools, with the degree of tacitness of knowledge. They suggested that Web 2.0 tools can be used for knowledge with a low to medium degree of tacitness, whereas knowledge with a high degree of tacitness requires rich media such as video conferencing and face-to-face communication.

More recently, Murphy and Salomone (2012) studied the effect of revealing personal identity on tacit knowledge sharing in online learning environments. They suggested that further research need to be carried out on conceptualising tacit knowledge in online space. Jarrahi and Sawyer (2013) also showed that social web tools, particularly public platforms such as Twitter, blogs and LinkedIn, are effective platforms for sharing informal knowledge and innovative ideas within and across organisations through facilitating the locating of both experts and expertise, socialising, reaching out, and the broadening of people's horizons. Although they did not discuss their findings in relation to tacit knowledge, the factors they identified are strongly associated with tacit knowledge sharing concepts.

The aforementioned studies all indicate that tacit knowledge sharing takes place in online environments to some extent. Each study investigated different

aspects of different online tools by adopting different theories and coming up with different findings. However, few studies attempted to study how tacit knowledge sharing may take place in social media environments.

The following sections will present the literature related to the potential contributions of social media tools for tacit knowledge sharing. However, before this a brief overview of social media definitions, features, and social media toolset is provided in the next section.

2.7 SOCIAL MEDIA

Many aspects of recent web technologies are referred to as social media, also known as social web, social software, social computing, social networking, and Web 2.0 (Osimo, 2008; Quasthoff, Sack, & Meinel, 2007). It is not easy to find a single agreed definition of the term social media. However, social media broadly refers to a new wave of WWW technologies that integrate interactivity, collaboration, possibility of user-generated content and easy-to-use web applications over the Internet. In other words, the main focus of social web technologies is on enabling users to be more active on the Internet; to produce, participate, collaborate and share knowledge or communicate with other people (Lindmark, 2009).

Social media can be defined as "collaborative online applications and technologies which enable and encourage participation, conversation, openness, creation and socialisation amongst a community of users" (Bowley, 2009). A wide variety of characteristics and capabilities have been identified as pertaining to social media (Bowley, 2009; A. Mayfield, 2008; Sarkkinen, 2009; Wahlroos, 2010; Zheng, et al., 2010; etc.). However, for the purpose of this study, only those features of social media will be considered that are relevant to knowledge sharing purposes. These are the capabilities of social media that encourage, support, and enable people to share their knowledge easily and effectively through different mechanisms. These characteristics of social media can be categorised into the following four main features.

User-generated content: Co-creation of content is one of the main characteristics of social media (Bowley, 2009; Elefant & Black, 2010; Sarkkinen, 2009). Users are no longer just simply readers, but rather they can contribute to creating, editing, commenting, annotating, evaluating, and distributing original

content in the social media space (Lerman, 2007). O'Reilly's (2005) principle of "harnessing collective intelligence" in the Web 2.0 environment applies when users collectively participate and collaborate in content generation (Matthee, 2011). Social media not only supports co-generated content but also assists in disseminating published material to a much wider community through mechanism such as bookmarking, RSS feeds, trackback notifications, rating, re-sharing, and so forth. Examples of social media platforms in which users participate in the co-generation of content are collaborative writing of Wiki pages or in the blogosphere, and also by commenting on and participating in discussions in various spaces.

Peer-to-peer communication: What differentiates social media from traditional web technologies is its power in connecting people together (one-to-many versus to one-to-one) in a more interactive way (A. Mayfield, 2008). Connectivity is one of the main features of social media, enabling people easily to stay connected with each other globally (Bowley, 2009; Matthee, 2011; A. Mayfield, 2008). Mutual communication is essential for knowledge sharing (Gordeyeva, 2010). Social media has provided an effective channel for such communication and social interaction by providing opportunities for real-time conversations, chatting, video or telephone conferencing, and so on.

Networking: Building a community of users is another main characteristic of social media (Lerman, 2007; A. Mayfield, 2008; Sarkkinen, 2009). It has enabled people with a common interest to gather together in an online space, locate each other, share their profiles and interest, develop relationships, and share their knowledge and experiences. Providing opportunities for locating experts in the field and establishing a knowledge community via social media might be helpful in sharing experiential and implicit knowledge among individuals (Gordeyeva, 2010; Wan & Zhao, 2007).

Multimedia oriented: Enabling users to easily share multimedia content such as text, image, audio, video, and other formats is another main feature of social media (Canali, Garcia, & Lancellotti, 2008; Lindmark, 2009). Social media has provided not only better opportunities for users to easily share their own multimedia files, created by themselves, but also to interact with other people about multimedia content through tagging, commenting and developing discussions about them on social web sites. YouTube, Flicker, and various vodcast/podcast services are

examples of social media platforms which are dedicated to multimedia sharing. These sites allow users to share a variety of audio, video and photo files on any subject (P. Anderson, 2007).

User friendly: Social media is best known for ease of use applications that do not require high technical proficiency or long formal courses (Elefant & Black, 2010; Wollan & Smith, 2011; Zheng, et al., 2010). They are easily accessible and available for everybody to use and thus participate in any aspect of existing facilities (A. Mayfield, 2008; Wollan & Smith, 2011). Simple, dynamic, attractive, joyful, easy for multimedia publication, customised, and cost-effective are some of the main attributes given to social media applications (Elefant & Black, 2010; Pavlicek, 2009; Zheng, et al., 2010). Compared to the traditional web tools, there are very few limitations in accessing or using social media tools (A. Mayfield, 2008).

The combination of features mentioned above has made social media a suitable channel for knowledge sharing activities. It helps people get connected, communicate with each other, build relationship, develop trust, and share their knowledge. It supports knowledge creation, distribution, and increases the visibility of knowledge more effectively than traditional KM systems (Gordeyeva, 2010).

Furthermore, a plethora of social media tools have been developed in the last decade and many new tools emerge every day with evolving features, functionalities, and affordances. Social media tools can be categorised into several groups. Table 2.5 (see next page) provides a summary of the most popular social web toolsets. They all share the principles of Web 2.0 outlined by Tim O'Reilly (2005), such as harnessing collective intelligence, user-generated content, collaboration, and architecture of participation.

Social media is one of the latest forms of information and communication technology that is rapidly growing around the world. It has been viewed as one of the recent enablers of tacit knowledge sharing. The next section presents a review of the literature about the potential contribution of social media to tacit knowledge sharing.

Table 2.5

Social Media Tools

Type	Definition	Examples	Sources
Blogs	Personal or public diaries on the Internet which are usually published in chronological order by their authors/bloggers	Wordpress Blogger	Zeng & Bell, 2008
wikis	Collaborative web sites which allow multiple authors and editors to contribute simultaneously on a single article from different geographical locations	Wikipedia Wikihow	Karpinski, 2008; McGee & Begg, 2008
Podcasts/ vodcasts	A method of distributing music or audio files of talks, interviews, readings, and lectures over the Internet, that can be downloaded and listened to by any media player	Apple/iPod BTPodShow Odeo	P. Anderson, 2007; Karpinski, 2008
Social networking sites (SNS)	A web platform where users are allowed to build personal profiles through which it is possible to communicate, exchange content, share digital assets, and network with other users	MySpace Facebook LinkedIn	Lehtimäki, Salo, Hiltula, & Lankinen, 2009
Social bookmarking/ tagging/ folksonomies	Applications that enable collection, classification and aggregation of online content, allowing users to create, store, and share personal lists of 'bookmarks' or 'favourites' with other users	Del.icio.us Digg Citeulike	Millen, Feinberg, & Kerr, 2005
Multimedia sharing	Web-based services that facilitate storage and sharing of audio and video content produced by the users themselves	YouTube Flickr Photobucket	Lindmark, 2009
Other	Collaborative writing tools, social gaming, micro-blogging, , data mash-up, and so on.	-	-

2.8 SOCIAL MEDIA AND TACIT KNOWLEDGE SHARING

Tacit knowledge sharing in online environments through different traditional web-based technologies and also through recent Web 2.0 tools was the focus of several studies reviewed in previous sections. Researchers are still debating whether online web tools can actually help tacit knowledge sharing. However, with the recent development of social web tools and communities as well as the development of new high bandwidth connections, which allows more real-time interactions, it has been argued that most shortcomings of tacit knowledge sharing are likely to diminish (Lopez-Nicolas & Soto-Acosta, 2010). Ease of use, informality, openness, multi-media oriented, and community-based features of social media applications build an environment in which social interactions and tacit knowledge sharing might be better

facilitated (Dave & Koskela, 2009; Gordeyeva, 2010; Lopez-Nicolas & Soto-Acosta, 2010; Steininger, et al., 2010; Zheng, et al., 2010).

Tacit knowledge sharing through social media has not been adequately researched and discussed in the literature. It has only been addressed briefly in a few studies that usually do not have adequate empirical support. However, reviewing the literature, it seems that there might be some commonality between social media features and the mechanisms of tacit knowledge sharing. As the content analysis of the literature showed, presented in Section 2.5, tacit knowledge might be captured and shared through several mechanisms such as social interaction, apprenticeship, sharing practical experiences, observation, imitation, storytelling, and informal relationship. On the other hand, social media is also known as a place for social interaction, networking, user-generated content, developing discussions, exchanging experiences, and so forth. Examples of these potential communalities taken from the literature are discussed below.

Social interaction

As the content analysis of the literature revealed (see Section 2.5), social interaction in the form of face-to-face communication, conversation, verbalisation, discussing, and dialoguing has been determined as one of the main prerequisites for tacit knowledge sharing (for list of references see Appendix A). For instance, Polanyi (1966), who first used the term tacit knowledge, asserts that close interaction is necessary for tacit knowledge transferring amongst individuals. Following Polanyi, Nonaka (1994) considered two dimensions (socialisation and externalisation) for tacit knowledge sharing in his popular SCEI knowledge creation model, with both of these processes based upon interaction and dialoguing between individuals.

The perspectives of these two key authors (Polanyi and Nonaka) can be traced in almost all later studies about tacit knowledge sharing. Murray and Peyrefitte (2007) viewed interpersonal interactions necessary for the effective diffusion of tacit knowledge. Yang and Farn (2009) also viewed tacit knowledge transferring as a natural process of social interaction. Song (2009) argued that face-to-face communication provides opportunities for immediate feedback and makes multiple cues available to people which then facilitates tacit knowledge sharing. Furthermore, job-related discussions and socialisation have also been considered important in tacit knowledge sharing (McAdam, et al., 2007).

On the other hand, social interaction is regarded as one of the main characteristics of social web initiatives. Zheng et al. (2010, p. 1) defined social media as "network technologies based media that support social interaction, social information aggregation and sharing". Lietsala and Sirkkunen (2008) recognised social interaction as one of the five main features of social web sites. Kamel Boulos and Wheele (2007) argued that the emergence of Web 2.0 tools have enriched online social interaction by integrating the "human approach to interactivity on the web", with "better support of group interaction" and "fostering a greater sense of community". Boateng, Mbarika, and Thomas (2010) also emphasised the interactivity and communicative aspects of Web 2.0 tools.

Marwick (2001) argued that online discussion forums, chat rooms and other real-time online interactions can effectively facilitate tacit knowledge sharing among team members. Lai (2005) also confirmed the possibility of tacit knowledge transferring in Internet discussion and chat sessions. Therefore, it can be argued that there might be a commonality between social interactions on social media sites and tacit knowledge sharing. As observed by Wahlroos (2010), the emerging social media seems to represent a significant potential for facilitating tacit knowledge sharing by providing live conversations, relationship networking and collaboration among individuals.

Experience sharing

Practical experience is recognised as one of the main mechanisms for tacit knowledge acquisition. Consequently, sharing personal experience through various methods such as storytelling, observation, participation, and discussion is also considered one of the powerful ways for transferring tacit knowledge (for list of references see Appendix A). People learn and obtain a sense of competence by sharing personal experiences (Busch & Richards, 2000). Nonaka (1994) points out that disseminating tacit knowledge is not possible without experience sharing. He calls this process of generating tacit knowledge through shared experience "socialisation". Haldin-Herrgard (2000) also emphasised exchanging experiences in the process of tacit knowledge diffusion. Yi (2006) also regarded sharing individual experience as a key source of tacit knowledge.

Correspondingly, user-generated content is recognised as one of the principal features of social web tools (Bowley, 2009; Elefant & Black, 2010; Sarkkinen, 2009;

Wirtz, Schilke, & Ullrich, 2010; Wollan & Smith, 2011). This feature of social media enables people to talk easily about their everyday stories and experiences on online space (Lindmark, 2009). Nilmanat (2011) demonstrated that in order to enable people to share tacit knowledge successfully in an online environment, the platform must support experience sharing, discussing, and storytelling.

Yi's (2006) study also concludes that sharing personal experience is one of the most effective ways that people use to exchange their tacit knowledge in online contexts. Malita and Martin (2010) consider social networking sites as digital storytelling tools. Strahovnik and Mecava (2009) also identified Web 2.0 tools such as blogs, social networking sites, video sites, and wikis as modern, efficient tools for exchanging ideas and experiences. Therefore, it can be hypothesised that social media supports tacit knowledge sharing by providing a space that enables people to share their experiences freely.

Informal relationship and networking

Developing informal relationships has been observed to be an efficient way of facilitating tacit knowledge sharing among people (for list of references see Appendix A). Swan, Newell, Scarbrough, and Hislop (1999) emphasised developing active networking between team members to facilitate the circulation of tacit knowledge. Haldin-Herrgard (2000) and E. A. Smith (2001) assumed interpersonal networking plays a vital role in easing the share of tacit knowledge. Hansen's (1999) study showed that strong ties are needed for effective dissemination of tacit and complex knowledge. Peroune (2007) viewed informal peer relationships as one of the preconditions for effective and accurate transfer of tacit knowledge. Joia and Lemos (2010) in their comprehensive bibliographical review found "relationship network of professionals" to be one of the major indicators of tacit knowledge sharing. Chen and McQueen (2010), Cavusgil et al. (2003), Fernie, Green, Weller, and Newcombe (2003) also argued that close, frequent and strong relationships are necessary for tacit knowledge sharing.

Similarly, social networking sites are well-known for connecting people together in an informal manner (Sandars, 2010; Wirtz, et al., 2010). Relationship building is the basis of many social networking sites, which allows experts with a common interest to gather together in an online space and interact synchronously/

asynchronously with each other about their everyday issues and share their knowledge and experience.

Bowley (2009) viewed connectivity as one of the main characteristics of social media. DiMicco, Geyer, Millen, Dugan, and Brownholtz (2009) found that "relationship building" is the most popular action on an enterprise social network site. Stefanone and Jang (2008) investigated the role of blogs in building and maintaining relationships. Therefore, it can be expected that social media may influence tacit knowledge sharing by fostering relationships among individuals as well as by assisting them to locate other experts in the field.

Observation-listening

Observation, watching, and interactive listening are other essentials mentioned in the literature for effective acquisition and sharing of tacit knowledge. Many researchers have confirmed that observation is one of the potential sources for tacit knowledge sharing (for list of references see Appendix A). Observing the practices of other people helps to adopt and imitate skills and behaviours. This is particularly ideal for the transfer of the technical components of tacit knowledge, that is, for sharing know-how, crafts and skills (Busch & Richards, 2000). This has also been highlighted in healthcare settings. For instance, Fox (1997) acknowledged the acquisition of clinical tacit knowledge through the observation of practices performed by experts at work. Paavola et al. (2005) explained orthopaedic surgeons' need for direct observation to obtain tacit knowledge which is required for better diagnosis of patients' problems. Furthermore, Greenhalgh et al. (2008) emphasised the role of observation of many patients in acquiring clinical tacit knowledge and experience.

Observation of skills can also be achieved by watching images and videos and through rich media such as video calls and videoconferencing in a digital domain. Wang (2010) recognised experience sharing as one of the main applications of videos. Mavromoustakos and Papanikolaou (2010) affirmed that people can share their experience through pictures and videos.

Raisanen and Oinas-Kukkonen (2008) determined that videos, audios and pictures were important media in transferring tacit knowledge. Eraut (2000) argued that mediating objects such as a picture, drawing, or video can motivate individuals

to discuss and share tacit knowledge. Nilmanat (2011) investigated tacit knowledge sharing through images in online discussion threads. Sarkiunaite and Kriksciuniene (2005) in their investigation of "impacts of information technologies to tacit knowledge sharing" argued that video and text-based conferencing contribute to the socialisation process of tacit knowledge.

On the other hand, multimedia sharing has been identified as one of the main characteristics of social web technology (Breslin, Passant, & Decker, 2009; Kazienko, Musial, & Kajdanowicz, 2008; Lindmark, 2009; Redecker, Ala-Mutka, Bacigalupo, Ferrari, & Punie, 2009). This multimedia-oriented feature has enabled people to store and share their pictures, videos, audios, and other multimedia files, produced by themselves, in social web space. In addition, it allows people to search, tag, and comment on multimedia files which is the main advantage of social media over traditional formats of sharing multimedia files (Lindmark, 2009; Redecker, et al., 2009). Podcasts and vodcasts are other social web initiatives that enable individuals to easily keep up-to-date with their favourite topics of interest (Breslin, et al., 2009; Redecker, et al., 2009).

The discussion above leads to the conclusion that there might be a link between watching and listening to multimedia files on social media and tacit knowledge sharing among individuals.

Mutual trust

Many studies have found that people would share their valuable tacit knowledge when there is mutual trust among them (for list of references see Appendix A). Yang and Farn's (2009) and Holste and Fields' (2010) studies indicated that there is a positive relationship between trust and professionals' intention to share and use tacit knowledge. Song (2009) argued that the efficacy of tacit knowledge sharing is directly affected by the existence of mutual trust among participants. In their discussion of the indicators of tacit knowledge sharing, Joia and Lemos (2010) argued that mutual trust reduces the perceived risks and uncertainties associated with tacit knowledge sharing. Similarly, this is confirmed by Lin's (2007) study of the effects of trust on tacit knowledge sharing within an organisation.

It is worth mentioning that mutual understanding is also necessary for people to trust each other (Laschinger, Finegan, Shamian, & Casier, 2000; Thoms, Garrett,

Herrera, & Ryan, 2008). Having a similar background (I. L. A. Lai, 2005) and using a common language (Chiu, Hsu, & Wang, 2006), in other words, using a common terminology and vocabulary, are also necessary to establish mutual understanding between team members, which in turn enhances the mutual trust required for a successful transfer of tacit knowledge.

In an online setting, building trust is viewed as important as in face-to-face communication for knowledge sharing purposes. Wu, Lin, and Lin's (2006) study showed that trust is positively associated with knowledge sharing in virtual teams. They also indicated that mutual communication and understanding establish interpersonal trust among virtual team members. Chen and Hung (2010) also found that there is a positive relationship between mutual trust and knowledge exchanging behaviour in professional virtual communities.

Some authors have introduced the concept of "swift trust" for the online environment, a type of trust that is usually formed in a temporary team (Jarvenpaa & Leidner, 1998; Meyerson, Weick, & Kramer, 1996; Zakaria, Amelinckx, & Wilemon, 2004). This swift or immediate trust allows people to initiate and continue sharing both explicit and tacit knowledge over time in an online community (Askay & Spivack, 2010). Therefore, it can be concluded that at least swift trust is essential for a successful transfer of tacit knowledge on social media sites.

Social media appears to support tacit knowledge sharing in many ways by triggering sociality and informal communication among experts, giving opportunities to harness individuals' collective intelligence, providing a collaborative as well as brainstorming space for new knowledge creation, making personal knowledge visible, and reducing the time and effort needed for knowledge sharing (Gordeyeva, 2010). However, only a few empirical studies have been conducted to confirm these theoretical arguments.

2.8.1 Social media tools and tacit knowledge sharing

As shown in the previous sections, there are now many tools available that are based on social media concepts. These tools can be categorised into several groups such as blogs, wikis, podcasts/vodcasts, social networking sites, social bookmarking, and multimedia sharing tools. Each group of tools may have different abilities to

facilitate tacit knowledge sharing. The potential of each social media toolset in supporting tacit knowledge sharing is discussed below.

Blogs and Microblogs. Blogs support tacit knowledge sharing by establishing a space that gives everyone a voice, enabling people to develop discussions, annotate and immediately document their thoughts, and capture or share personal knowledge and insights in a friendly environment (Chatti, et al., 2007; Gordeyeva, 2010). Allowing people to talk about their personal experiences is one of the main mechanisms for sharing tacit knowledge (Ardichvili, et al., 2003). Blogs provide such a space for storytelling which might be one of the most important advantages of blogs for facilitating the externalisation of tacit knowledge. The ability to provide immediate feedback on blog posts is also helpful for transferring tacit knowledge (Wan & Zhao, 2007). They are also helpful in networking and strengthening socialisation within and across organisations (Jarrahi & Sawyer, 2013), which are essential for tacit knowledge creation and sharing.

Wikis. wikis can affect both externalisation (articulating and writing down personal knowledge on wikis) and internalisation (accumulating and processing the information offered by wikis and integrating it into the individual knowledge) of tacit knowledge (Cress & Kimmerle, 2008). They assist tacit knowledge sharing by providing a field for collaborative knowledge capturing and sharing as well as by enabling social interactions among contributors. They are one of the best examples of social media tools for harnessing collective intelligence (Chatti, et al., 2007; Gordeyeva, 2010).

Social networking sites (SNS). The main role of SNS in sustaining tacit knowledge flow is in building a voluntarily-based social CoP, which is essential for tacit knowledge sharing (Chatti, et al., 2007; Hildrum, 2009; Parker, 2011). SNS enable individuals to locate experts, foster peer-to-peer relationships, promote technical discussions, and provide areas for socialising and personal knowledge sharing (Hildrum, 2009; Raisanen & Oinas-Kukkonen, 2008). Embedded instant messaging and discussion forums support concurrency and the co-presence of users in SNS environments which help to trade tacit practical knowledge among participants (Raisanen & Oinas-Kukkonen, 2008). In addition, SNS increase the level of interpersonal trust through establishing closer and more frequent communication

among members, which are both necessary for the effective transfer of tacit knowledge (Gordeyeva, 2010).

Multimedia sharing tools (podcasts/vodcasts). These tools are particularly useful in the internalisation process of knowledge sharing which can enhance the learning and conceptualising of existing knowledge. In addition, they are useful in demonstrating technical know-how and transferring hands-on experiences which may not be expressible by verbalisation or through other formal documentation methods (Chatti, et al., 2007).

Social bookmarking. Although social tagging plays the role of indexing in structured knowledge sharing databases, it might also facilitate tacit knowledge sharing by connecting people with common interests and by harnessing individuals' collective intelligence as they allocate, organise, and share personalised tags with each other (Chatti, et al., 2007). In addition, it can be used as an annotation tool as it enables people to add new tags for specific contents (Raisanen & Oinas-Kukkonen, 2008). Tagging might be resembled to highlighting key ideas in a book with a marker, enabling the transfer of underlying logic and key information (Gordeyeva, 2010). Another impact of social tagging on tacit knowledge sharing might be in enabling experts to locate peers with similar interests by following their personalised tags (Parker, 2011).

2.9 PHYSICIANS' USE OF SOCIAL WEB TOOLS

The use of the Internet as one of the main communication tools and also as one of the principal ways of seeking medical information has become increasingly popular among healthcare professionals (Bennett, et al., 2006; Romano, et al., 2012; Séverin, et al., 2012). The latest findings from Manhattan Research (2012a, 2012b), a global market research firm which surveys physicians' use of the Internet across 17 countries and publishes the results annually, reported that more than 80% of physicians in all countries studied use the Internet for professional purposes and believe that the Internet is essential to their practice. The same report reveals that U.S. physicians (N=3,015) spend an average of eleven hours per week online for professional purposes only, which is 2.5 times more than 2006. Parekh et al. (2009) similarly reported that the Internet is the most used resource by U.S. physicians for finding medical information.

Among the Internet initiatives, the use of social media platforms by healthcare professionals has grown considerably in recent years (Antheunis, et al., 2013; Cooper, et al., 2012; McGowan, et al., 2012), with most physicians and other medical practitioners having already begun formally or informally to embrace most social web tools such as blogs, wikis, and social networking websites.

Physician-only social networks such as Sermo, Ozmosis, and Medscape have attracted over 100,000 members each (see Appendix B for further detail about well-known social web tools used by clinicians). A survey by Cooper et al. (2012) shows that 59% of U.S. physicians (N=1750) used social networking sites, more than 41% listened to podcasts, and 12.9% commented on blogs. Similarly, a study by McGowan et al. (2012) also showed that 24% of U.S. physicians (N=485) use social media regularly (on a daily base) and over 60% use it on a weekly basis or even more frequently to look for medical information. According to this study, nearly 60% of U.S. physicians perceived social media as a useful, engaging, and good means to receive the latest and high-quality medical information, and about 60% believed that social media enabled them to practise more effectively. Recent findings from Manhattan Research (2012b) also show that more than two-thirds of U.S. physicians used online videos to learn and keep abreast of the latest clinical information.

Adoption of social media in other countries is also growing. Manhatan Research (2012a) showed that about 22% of European (UK, France, Germany, Spain, Italy) physicians (N=1,218) adopted physician-only social networks (UK was the highest with 48%). A survey conducted by EPG Health Media (2010) among 315 healthcare professionals (including all specialisations) in the same European countries also showed that almost 38% of healthcare professionals are engaged in health-related discussions via online social networks and 83% would like to participate in social space provided there are proper guidelines and regulations. According to this study, the majority of European physicians (60%) used social media to communicate with peers rather than with patients or pharmaceutical companies. Antheunis, et al. (2013) also found that Dutch physicians use primarily LinkedIn, Twitter, and YouTube for professional purposes.

The number of medical bloggers has also increased during the last decade. In addition to the individual medical bloggers, most hospitals have also launched their own blogs. They use blogs for sharing views, perspectives, news, recent knowledge,

and any information related to health and healthcare (Petrock, 2010). Furthermore, research shows that nearly half of U.S. physicians active online visit Wikipedia to seek medical information and 10% contribute to Wikipedia's content (Edwards, 2010). The use of Twitter is also increasing among physicians; however, it is still only a small proportion of physicians who are active users of Twitter (Lulic & Kovic, 2012).

The use of smartphones and tablets, which are known for providing easy and instant access to social media tools, has also increased significantly among physicians around the world. According to Manhattan Research (2012b), 85% of U.S. physicians use a smartphone, and 62% use a tablet for professional purposes; 84% of Australian physicians use a smartphone, and 54% use a tablet; in Turkey 64% use a smartphone, and 35% use a tablet; in five big European countries (UK, France, Germany, Italy and Spain) 69% of doctors use a smartphone, and 26% use a tablet; in Brazil 51% use a smartphone; and in India 17% use a smartphone. Manhattan Research has published a lot of detail about social media use by physicians in different countries. However, the full details of the reports were not available to the researcher.

According to Petrock (2010), sharing medical experience, ideas, and points of view anonymously is the primary purpose of physicians joining physician-only social networks, while other reasons include: finding information about new offerings or treatments, developing relationship with colleagues, and in rare cases communicating with patients, and marketing their services.

A study by DocCheck surveyed 441 members of one of the popular physicians' social network in Europe, and reported that physicians use social networks for the following purposes: Getting help from their peers about medical issues they encounter in their daily practice (60%); re-sharing information they received via other sources (56%); sharing techniques or insights they learned or developed (40%); and for other reasons, such as talking about their opinions, correcting facts, and so on (11%). The majority of the study participants also stated that medical contents and comments posted by their colleagues on social networks were helpful for them. An interesting finding of this study was that more than 60% of physicians who participated in the study believed that peer-reviewed journals will soon be replaced by online contents created by medical professionals (DocCheck, 2010; Mack, 2010).

In summary, several studies have highlighted that the use of social media among physicians and medical practitioners has been significantly increasing. Such an amount of use requires further research to explore the potentials and shortcomings of these emerging technologies in regard to the specific information needs of medical communities. Very few studies have been conducted in this area, particularly on the subject of tacit knowledge exchange among healthcare professionals in online social communities. The current research is aimed at filling parts of this knowledge gap by seeking physicians' viewpoints and experiences regarding the potential contributions of social media in facilitating tacit knowledge sharing.

2.10 DISCUSSION

ICT has been regarded as one the main enablers of knowledge sharing in this century. However, in terms of tacit knowledge sharing the literature review has shown that there are currently different views held regarding the potential role of ICT in facilitating tacit knowledge sharing among individuals, some supporting and some opposing the view that ICT can facilitate tacit knowledge sharing. It may thus be argued that the role of ICT in tacit knowledge sharing is currently uncertain. Despite the fact that organisations are greatly interested in facilitating experts' tacit knowledge sharing within their organisation, little research has been done in the area of ICT for tacit knowledge sharing (Haldin-Herrgard, 2000). This could be considered a major gap in the KM literature that needs further investigation.

Meantime, information technology is constantly changing and bringing new opportunities for knowledge sharing. Social web technology is one of the recent technologies that has captured the attention of some researchers, with some now asserting that it may facilitate tacit knowledge sharing. In their opinion, these technologies may have the ability to alleviate some of the issues and challenges existing in the tacit knowledge sharing process among experts. For example, Khan and Jones (2011) suggested that, as new social media technologies emerge in forms of online social networks, blogs, and wikis and are being used widely in organisations, they must be addressed in the discussions on tacit knowledge sharing. Hsia, et al. (2006), Abidi (2009), and Steininger, et al. (2010) also argued that social web technologies are effective tools to facilitate the transfer of tacit knowledge among clinicians. A few studies have also attempted to make a link between social web technologies and the knowledge creation processes, including tacit knowledge

conversions (Chatti, et al., 2007; Lopez-Nicolas & Soto-Acosta, 2010; Marwick, 2001; G. Murphy & Salomone, 2012; Sarkiunaite & Kriksciuniene, 2005).

Apart from these few theoretical arguments put forward in the literature, there has been a lack of academic research specifically investigating the contributions of social media to tacit knowledge sharing. In addition, it was noticed that although these studies briefly discussed the potential of social media for tacit knowledge sharing, most lack empirical support for the arguments stated. Furthermore, the tools examined in relation to tacit knowledge sharing were mainly traditional web-based technologies. Social web tools, which are presumed to be more appropriate for building an environment that may facilitate tacit knowledge sharing (Abidi, et al., 2009; Dave & Koskela, 2009; Hsia, et al., 2006; Steininger, et al., 2010; Zheng, et al., 2010), was not the main focus of these studies. In other words, the role of social web tools for tacit knowledge sharing is currently unknown, despite the fact that social web sites are currently popular and experiencing widespread growth among employees and organisations (Hughes, Joshi, Lemonde, & Wareham, 2009).

Many dimensions of tacit knowledge sharing in social web environments have not been examined yet. Many questions are still unanswered and need to be explored on different social web platforms and also in different organisational contexts. Examples of research questions might be: How and to what extent are social web tools effective in facilitating tacit knowledge sharing? What are the potentials of social web technologies in this regard? How do social web platforms comply with the requirements of tacit knowledge sharing? What is needed to improve the capacity of social web initiatives in this regard? What are the differences between face-to-face and online tacit knowledge sharing over social media? What are the capabilities of different social web tools? What are the barriers (technical, legal, motivational, etc.)? There are many other questions which need to be investigated in the context of these technological trends regarding tacit knowledge sharing behaviour.

In order to respond to these questions, IS research needs to evolve to help organisations and individuals adapt to the changes made by social web technologies in the workplace (Guo, 2009; Manoj & Andrew, 2007). More exploration and a greater understanding is needed to capture and share experts' experiential knowledge, particularly if social web tools are used. There is a need to update the literature in this domain by re-examining the new emerging web solutions for tacit

knowledge sharing. There is a need to re-conceptualise tacit knowledge sharing in the social web era. There is also a need to support the theoretical arguments with appropriate empirical data from a variety of fields.

In particular, in a healthcare context very few studies (as shown in Table 2.6) have been conducted to date to explore the potential contributions of social media for tacit knowledge sharing among physicians. Social web sites are currently very popular and have attracted increasing interest of physicians and healthcare organisations to use these tools for knowledge sharing and thus require further investigation to discover the potential and shortcomings of these emerging tools in regard to the specific information needs of medical communities.

Table 2.6

Knowledge Sharing Through Social Technology in Healthcare – Key Contributors

Contributors	Target Groups	Type of Social Tools	Research methods	Main focus
Hara & Hew, 2007	Nurses	Online community of health-care professionals	- Case study	Examining types of activity and types of knowledge nurses share in an online listserv
Abidi, et al., 2009	Paediatric health practitioners	Online discussion forum	- Social network analysis - Content analysis	Conceptual model for designing Web 2.0-based knowledge sharing medium
Curran, et al., 2009	Urban clinicians (nurses, physicians, and pharmacists)	Virtual community of emergency practice	- Content analysis of discussion boards - Survey	Practice knowledge seeking and sharing among rural and urban clinicians in online communities
Poissant et al., 2010	Chronic stroke care team	Community of practice- Social networking	- Content analysis - Semi-structured interviews - Survey	Assessing the impact of developed E-collaborative platform in facilitating knowledge translation activities
Steininger, et al., 2010	Patients and doctors	Web 2.0-based portal	- Survey	Providing high-quality information to patients via Web 2.0 portal

Most of the research that has been done thus far in the area of social media in healthcare has been about the usage patterns (Antheunis, et al., 2013; Cooper, et al., 2012; Lulic & Kovic, 2012; McGowan, et al., 2012). Very few studies have been conducted to investigate knowledge sharing, particularly tacit knowledge exchanging, among physicians in online social media communities. As shown in Table 2.6, studies that investigated social web platforms in healthcare context mostly focused on identifying the types of knowledge and information physicians share in

online communities rather than conceptualising how these platforms may support tacit knowledge sharing.

In addition, social media platforms and their affordances have changed significantly even over this comparatively short timeframe. None of these studies (listed in Table 2.6) would have been able to consider Facebook, YouTube, or Twitter particularly well, since these platforms only became widely popular after these studies were conducted. Therefore, this study is aimed to explore the potential contributions of social media in supporting tacit and experiential knowledge sharing among physicians, and will demonstrate this by presenting findings from a qualitative survey conducted with physicians who are active users of social media.

2.11 CONCLUSIONS

Due to the globalisation and the need for faster and effective communication, currently a lot of businesses moved to employing web-based technologies as one of their main communication tools. Social web tools have been viewed as one of the recent enablers of tacit knowledge sharing in the literature. It has been argued that ease of use, informality, openness, multi-media oriented, and community-based features of social web platforms may create a great *ba* (shared context) for social interactions and hence increase the chance of tacit knowledge sharing among knowledge seekers. However, despite the sporadic theoretical discussions in the literature arguing that tacit knowledge sharing may take place in social web environments, it was noticed that there is still lack of theoretical frameworks and empirical studies supporting those arguments. There is a need to re-examine these recent web technologies in terms of their efficacy and capacity for tacit knowledge sharing, the most critical knowledge of people and organisations.

This chapter reviewed the literature relating to tacit knowledge sharing through ICT and highlighted the need for further studies in this area by discussing the current debates in the literature and pointing out emerging questions and gaps for future studies. The study outlined a series of research questions that might be worth investigating in different types of social web tools and also in different organisational contexts. The current study aimed to explore the potential of social media tools in facilitating medical tacit knowledge sharing among physicians for two main reasons: first, the critical role of tacit knowledge in clinical context and the need to use and

optimise emerging technologies to facilitate tacit knowledge sharing among the clinical community; second, the poverty of empirical research investigating medical tacit knowledge sharing through social media technology while there is a growing interest in the use of social networking technologies among physicians.

The next chapter will present the research methodology used in the study to achieve the research goals.

Chapter 3: Research methodology

3.1 CHAPTER PREVIEW

The main purpose of this study is to investigate the impact and potential of social media tools in facilitating tacit knowledge sharing among physicians. Following the research purpose, the main research question and objectives were outlined in Chapter 1. This chapter will discuss the research methodology, data collection, and data analysis methods used to answer the research questions. The following paragraph outlines the chapter's organisation.

Firstly, an investigation is performed into the main research classifications in social science and information systems, whereupon a commonly accepted set of the dimensions are identified and discussed in relation to the study. Secondly, an overview of the research method, a qualitative survey, is presented together with the rationale for choosing this method, followed by a description of the data collection procedures (semi-structured interview) used to gather qualitative data from target population of the study (physicians). Thirdly, the data analysis methods are discussed in detail, followed by, fourthly, a discussion of the ethical issues related to the study. Finally, the chapter closes with a summary of the research method employed.

3.2 METHODOLOGICAL CONTEXT

A broad variety of dimensions has been identified to describe and theoretically classify research studies. Examples of the dimensions which are predominantly used in popular methodology textbooks include: paradigm, logic of reasoning, outcome of research, purpose of the study, methodological approaches used, and time periods of the study (Babbie, 2011; Myers, 1997; Neuman, 2007; Orlikowski & Baroudi, 1991; Pickard, 2007; Tripodi & Bender, 2010). These dimensions provide an appropriate lens through which a study can be better approached and described. This section intends to position the current study within these commonly accepted dimensions of research studies.

Table 3.1 shows the research dimensions adopted in the study. The table also shows how the current study might fit into the different classifications of research

studies. Each category, and how the study might be placed within these, is discussed in the following sub-sections.

Table 3.1

Common Research Dimensions and Where the Study is Placed

Paradigm	Logic	Outcome	Purpose	Methodology	Time
Positivist	Inductive	Basic	Exploratory	Qualitative	Cross-sectional
Interpretive	Deductive	Applied	Descriptive	Quantitative	Longitudinal
Critical	Abductive	--	Explanatory	Mixed-method	--

Note. Marked area shows where the current study might be placed

Sources: Babbie, 2011; Myers, 1997; Neuman, 2007; Orlikowski & Baroudi, 1991; Pickard, 2007; Tripodi & Bender, 2010

3.2.1 Paradigm

Firstly, the methodological consideration of the study requires identifying the philosophical underpinnings of the study. Information system (IS) studies can be classified into three philosophical paradigms: positivist, interpretive, and critical studies (Myers, 1997; Neuman, 2007; Orlikowski & Baroudi, 1991). Positivists treat social reality as being absolute and independent of the observer's perceptions (Myers, 1997; Neuman, 2007). Positivist studies generally formulate and examine hypotheses and causal relationships, consider quantifiable measures of variables, and involve generalisation about a phenomenon from a sample to the whole population of the study (Orlikowski & Baroudi, 1991).

In contrast, interpretivists assume that social reality is not independent of peoples' interpretations and experiences. It is always subjective and socially constructed by humans (Myers, 1997; Neuman, 2007). Interpretive studies deal with subjective experiences, perceptions, and meanings that people give to assign to social world (Klein & Myers, 1999). Epistemologically, interpretivists, unlike positivists, believe that knowledge about social world can only be obtained by getting inside the world of those producing the knowledge. In other words, in interpretive research constructs are derived by in-depth examination (for example, by conducting a field study) of phenomenon of interest in the field by the researcher. The constructs identified by the researcher are almost equivalent to the perspectives of the study's participants. Furthermore, interpretive research might always be influenced by the

investigators' prior assumptions, beliefs, values, and interests (Orlikowski & Baroudi, 1991).

Finally, critical researchers regard social reality as being historically constituted and as predominantly affected by power relations in society (Myers, 1997; Neuman, 2007). Critical research, unlike positivist and interpretive studies, places critical reflections, abductive reasoning, and a reflexive-dialectic orientation at the centre of the research practice. It principally emphasises the "oppositions, conflicts and contradictions" in the status quo (Myers, 1997).

A review of the basics of these three major philosophical viewpoints in relation to the purpose of the current study clearly indicates that the current study is primarily an interpretive study. Tacit knowledge sharing is a complicated phenomenon that cannot be objectively studied. This research relies on analysing and interpreting the participants' experiences and meanings that they assign to the phenomenon of tacit knowledge sharing through social media platforms, making it an interpretive study that allows obtaining deeper understanding of the topic. The study employs qualitative methods to explore physicians' subjective opinions and perspectives about and experiences with social media support in facilitating tacit knowledge sharing. The aim of this study is neither to examine research hypotheses and causal relations, nor to look for scientific objectivity and to critique conventional norms and knowledge bases. Therefore, the interpretive paradigm seems more appropriate to achieve the goals of the current study.

In addition, the study findings are derived from the process of interpretation of the participants' experiences and perspectives by the researcher. That is, the researcher also is part of the research process, as required by the interpretive epistemology. The role of the researcher will be explained in more detail in Section 3.10.

3.2.2 Logic

Philosophical considerations also demonstrate the logic of the study. A study might adopt inductive or deductive reasoning to achieve its purpose. Positivist studies are mostly deductive while interpretive studies are fundamentally inductive. The deductive method takes a "top-down" approach in which a study is approached first by formulating hypotheses and developing an a priori-model and then aiming to

collect empirical data to confirm or reject the a priori-model, whereas the inductive method takes a "bottom-up" approach which emphasises drawing conclusions and building theories through detailed observations of events (Neuman, 2007). As the current study has not already developed hypotheses or a theoretical model, it obviously takes a "bottom-up" or inductive approach in which it seeks to first collect empirical data on the phenomenon under study, and then to frame the conceptual model of the study through analysis of the collected data.

However, the study also conducted a content analysis to reveal mechanisms and conditions necessary for tacit knowledge sharing (see Section 2.5 in Chapter 2 and also Appendix A). Although these codes were not adequately studied in social media context, some of these codes were also confirmed in the current study findings. Therefore, it might be argued that the bottom-up approach to derive themes from codes was also informed by the literature.

3.2.3 Outcome

Another important categorisation of research studies is based on the outcome or possible use of the research. From this perspective, studies might be either basic (also called fundamental or pure) or applied (Babbie, 2011; Neuman, 2007). A group of authors have also classified action research (Kumar, 2002; McClure & Hernon, 1991) and evaluation research (Miller & Salkind, 2002; Verma & Mallick, 2000) under this categorisation. However, most of the recent methodological textbooks mainly refer to basic and applied research and categorise evaluation and action research under applied studies (Babbie, 2011; Bless, Higson-Smith, & Kagee, 2007; Neuman, 2007). Basic research usually engages in theory building and does this via a large scale investigation. It rarely involves practical applications, at least in the initial stages. Unlike basic research, the principal purpose of applied research is to solve a particular problem or issue in real-life situations (Neuman, 2007). The present research goals and questions manifest that it is primarily basic research that highlights social media contributions to tacit knowledge sharing within knowledge management (KM) models and theories, particularly in a healthcare context. The study develops an important theoretical connection between social web communities and tacit knowledge sharing. Furthermore, the main audiences of this study are academic communities, which supports the view that it is a basic study for the most part. However, the study also has some practical applications, as explained in

Chapter 1 and the concluding chapter. Although this might be considered indicative of applied research, the practical applications of the study are outweighed by the predominantly basic nature of the study.

3.2.4 Purpose

Another research dimension that most methodology textbooks discuss is the purpose of the study. From this perspective, studies might be exploratory, descriptive, or explanatory (Neuman, 2007; Tripodi & Bender, 2010). Exploratory research examines new ideas, addresses "how" and "what" questions, uses largely qualitative methodology, and formulates questions for future studies (Neuman, 2007). Descriptive research employs a variety of data gathering techniques to present a detailed picture of events and often seeks to answer "who, what, when, where, and also how" questions (Neuman, 2007; Tripodi & Bender, 2010). A descriptive study may investigate correlations and associations; however, it usually does not involve the testing of hypotheses and exploration of causal relationships (Tripodi & Bender, 2010). In practice, descriptive and exploratory studies are often mixed and largely blur together (Neuman, 2007, p. 16).

In contrast to exploratory and descriptive research, explanatory research provides reasons for "why" things happen and seeks causal relationships and sources of events (Neuman, 2007). The current study is most likely an exploratory study, as it uncovers new meanings and relationships in the area of social media contribution to tacit knowledge sharing among physicians, focuses substantially on "how" and "what" questions, and provides directions for future studies. Nevertheless, some levels of a descriptive approach are also evident when the study describes physicians' patterns of social media use.

3.2.5 Methodology

Another popular classification of research studies is based on the methodology employed in the study. From this perspective, a study might be qualitative, quantitative, or mixed-method (Babbie, 2011; Neuman, 2007; Pickard, 2007). Qualitative research emphasises acquiring and analysing qualitative data or meanings (words and sentences) in order to answer the "how" and "why" research questions related to the phenomenon under study. Conversely, quantitative research uses quantitative data or numerical and measurable data with accompanying statistical

analysis to answer the research questions of "what" and "how many" about the phenomenon under study (Babbie, 2011). Qualitative and quantitative approaches might sometimes be employed together to answer a specific research question, which is then called mixed-method research. The general differences between qualitative, quantitative, and mixed methods are shown in Table 3.2.

Table 3.2

Quantitative, Qualitative, and Mixed Method

Quantitative	Qualitative	Mixed method
Based on meanings derived from numbers	Based on meanings expressed through words	Based on meanings derived both from numbers and those expressed through words
Data is numerical and standardised, collected using a predetermined instrument	Data is non-standardised, such as interview, document, observation data	Multiple forms of numerical and qualitative data is collected
Data is analysed using statistical methods	Data is analysed through the use of conceptualisation and interpretation	Both statistical and qualitative approaches are used for data analysis

Adapted from: Creswell, 2009; Saunders, Lewis, & Thornhill, 2009

The current study is predominantly qualitative in nature, since it mainly looks for physicians' viewpoints, perceptions, and experiences of using social media for tacit knowledge sharing among the clinical community. In addition, due to the under-explored nature of the topic and the lack of literature, a qualitative approach was deemed appropriate for achieving the goals of the study (Taylor & Bogdan, 1998).

3.2.6 Time

The last dimension of the research pertains to the time of the study. From this perspective, research studies could be either cross-sectional or longitudinal. While cross-sectional research covers a snapshot of a single time point, longitudinal research is carried out over several time points (Neuman, 2007). Although a longitudinal study would be more helpful in understanding the phenomenon under the study, given the continuing changes to the shape and functionalities of social media platforms over time, the study did not take a longitudinal approach for practical reasons: there were no comparable earlier studies with which the findings of the current study could have been compared, and a single Ph.D. timeframe was not considered to offer sufficient time for conducting a longitudinal study.

This section describes and justifies the theoretical foundations of the study within the popular research taxonomy used in research methodology textbooks. It could be concluded that this study might be considered an interpretive, inductive, basic, exploratory, qualitative, and cross-sectional study. The following section will discuss the specific research methodology, a qualitative survey, used in the study.

3.3 QUALITATIVE SURVEY DESIGN

Research methodology should be designed on the basis of the research goal and corresponding questions (Onwuegbuzie, et al., 2003). As discussed in the previous section, the qualitative approach seems more appropriate to achieving the purpose of the study. However, due to the availability of various qualitative methods and the specific nature and context of each study, choosing a suitable method or methods is not always a simple task. For the purpose of this study, several research methods were considered prior to the selection of the main method employed in the study. Finally, a qualitative survey design (Dudley, 2010; Fink, 2003; Marsland, Wilson, Abeyasekera, & Kleih, 2001) was deemed appropriate for accomplishing the research goals for both theoretical and practical reasons.

Theoretically, the study is a piece of explorative research, which adopted interpretive paradigm and employed a qualitative method to explore in particular the role of social media in supporting tacit knowledge sharing among physicians. The proposed question of "how does social media facilitate tacit knowledge sharing?" is also an exploratory question by nature. The survey method provides a portrait of what people think about a phenomenon or what they would do in a specific context (Cress & Kimmerle, 2008; Neuman, 2007). A qualitative survey is one of the research methods suitable for investigating exploratory questions (Dudley, 2010), which is also the case in the current study. This method was deemed to provide opportunities for an in-depth understanding of physicians' perspectives, knowledge, and experiences of tacit knowledge sharing in social media environments.

A survey can be either quantitative or qualitative (Fink, 2003; Jansen, 2010). A quantitative survey is ideal for hypotheses testing and could present a broad picture of participants' experiences, perceptions, and any influential factors in the areas of the study. However, quantitative surveys lack the flexibility of qualitative methods in providing a greater depth of understanding of a phenomenon (Wolff, Knodel, &

Sittitrai, 1993). The major issues in conducting a quantitative survey are its dependence on respondents' willingness to participate and any misunderstandings that might occur in respondents' answering some questionnaire questions (Saunders, et al., 2009). Therefore, to avoid some of these limitations of a quantitative survey and in order to obtain in-depth insight and details about the phenomenon, the qualitative survey method was adopted.

A survey is qualitative when it carries out a collection of qualitative data and employs methods of analysis appropriate to qualitative data, instead of statistical quantitative methods, to explore knowledge, opinions, and meanings that people assign to their experiences (Fink, 2003). Jansen (2010) defines a qualitative survey as a simple research design that is appropriate to studying a diversity of topics within a population rather than seeking to arrive at the analysis of the distribution of phenomena. He criticises the way in which the qualitative survey design is usually discussed under the label of grounded theory and is surprisingly unspecified in most of the major methodology textbooks, in spite of its widespread use by researchers. Table 3.3 shows the differences between qualitative and quantitative surveys.

Table 3.3

Quantitative and Qualitative Survey

	Qualitative survey	**Quantitative survey**
Topic	Any topic	Any topic
Aspects (formal object)	Diversity	Frequency distribution
Empirical domain	Any population (collection)	Any population (collection)
Unit of data collection	Members of population	Members of population
Sampling	Diversity; by purpose	Probability; by chance
Criterion for sample size	Saturation, coverage of population diversity	Precision of estimate (CI)
Data collection	Any	Any
Data analysis	Coding data (downward and upward) in objects, dimensions and categories, combinatory synthesis of diversity, deterministic explanation, etc.	Counting frequencies, descriptive statistics, estimating parameters, correlation, factor-analysis, etc.

Source*:* Jansen, 2010

Qualitative surveys deal with "what" and "how" questions rather than "how many" and other numerical questions (Fink, 2003). They are useful when there is not adequate literature to design close-ended questions, and when there are issues in

gaining access to populations and recruiting large samples of participants, and when there might be difficulties in understanding questions (Fink, 2003). All these issues were also present in the current study. There was a lack of literature support to develop a well-defined questionnaire for the study. In addition, the concept of tacit knowledge is complex and it is very difficult to operationalise it using a common questionnaire. There were also practical issues in recruiting a large population sample. Furthermore, the aim of the study was to obtain physicians' in-depth, unique perceptions and experiences of the phenomenon in response to research questions rather than seeking representativeness and generalising the findings of the study (Fink, 2003).

In addition to the theoretical rationales discussed above, practical considerations also affected the final decision to choose a qualitative survey design. The study had limitations such as the time and material resources available, and issues with access to the study population. Physicians are usually busy people and recruiting a large sample of them and involving them in a non-medical study with a data collection stretching over a lengthy period of time was not really possible for the researcher, being a student. Therefore, effective methods were needed not only for the collection of data, which required the study participants to respond to the research questions appropriately, but which was also feasible in spite of existing constraints. A qualitative survey is recognised as a less intrusive means of gaining access to a study population and provides participants with more freedom and the choice to participate or not.

The discussion above suggests that a qualitative survey was an appropriate choice for the current study, being mindful of the research objectives and research questions, and the limitations of time and resources.

3.4 POPULATION OF STUDY

The primary population of the study were physicians (general practitioners and specialists) who worked in hospitals, clinics and other clinical environments around the world. In accordance with the aim of the study, three criteria were considered for the recruitment of study participants.

The first criterion concerned participants' clinical experience; only physicians who had a minimum of five years' clinical experiences were approached for the

study. The reason for this criterion is that it supports tacit and experiential knowledge concepts. Tacit knowledge is more "experience based" and "job specific" (McAdam, et al., 2007; p.45). Therefore, the more experienced the person, the more tacit knowledge she/he may have to share (L. A. Joia & B. Lemos, 2010). Research suggests that a minimum of 10,000 hours' work is required for novices to become experts (Nash & Collins, 2006). In clinical fields, Benners' expertise model (Benner, Tanner, & Chesla, 2009) requires an expert practitioner to have more than five years' experience. This study adopted Benners' expertise model and set the minimum of five years' clinical experience for the study participants to ensure that they had sufficient experience and therefore, tacit knowledge.

The second criterion concerned physicians' experience with social media tools, and thus only physicians who had engaged with social media tools on a regular basis were recruited. The minimum requirement for this purpose was defined as the participants' use of one of the social media tools such as Twitter, blog, or YouTube at least twice a week. If the participants had only limited experience in social media spaces, they would not have been able to accurately evaluate the viability of social media for tacit knowledge sharing.

The final criterion concerned accessing the study population. Getting access to physicians is not always a simple task, particularly for researchers and students who are not involved in any medical practice or research. Therefore, physicians who were relatively easy to access through online tools or via university relationships with the healthcare industry were approached.

The study population was not limited to specific professional categories of physicians, at least not in the early stages, because the aim of the study was not to profoundly explore the nature or application of medical tacit knowledge for specific groups of physicians. Rather, the focus was on mechanisms of tacit knowledge sharing, particularly by exploring the potentials of social media in facilitating this process amongst physicians. Indeed, based on the literature review, the presumption of the study is that tacit knowledge sharing is an important part of physicians' everyday practice and is critical for delivering high quality patient care. However, there is a variety of mechanisms and tools for sharing this unstructured knowledge, ranging from traditional face-to-face meetings at the workplace to using various online knowledge sharing tools. As face-to-face tacit knowledge sharing has already

been discussed adequately in the literature, this study investigates the potentials of one of the current leading and fastest growing sources of media, social media, in helping physicians to communicate and exchange their tacit knowledge.

In addition, it was not feasible for the researcher to recruit an adequate, available, and accessible number of specific groups of physicians who use social media regularly by the time of data collection. Therefore, for the purpose of this study, physicians from all specialisations were targeted for data collection.

3.5 SAMPLE AND RECRUITMENT

Sampling could be either probability or non-probability sampling. Probability sampling techniques (including simple random, systematic, stratified, and cluster) are usually utilised in quantitative research, whereas non-probability sampling techniques (including convenience, purposive, and snowball sampling) are mostly used in qualitative research (Neuman, 2007). Since this research adopted a qualitative approach, it employed non-probability sampling.

Non-probability sampling for the study was accomplished by utilising purposive and snowball sampling. In other words, interviewees were purposively selected from the volunteer participants, based on considerations of suitability to contribute to the issues being studied, and if they were easily accessible. Snowball sampling was also employed in cases in which interviewees referred other eligible participants. The other criteria for participation in the study were already discussed in Section 3.4, *Population of Study*.

There are no rigid rules about the actual sample size required for qualitative data collection methods, that is, how many participants are sufficient to guarantee the validity and generalisability of findings from semi-structured interviews (Bui, 2009; Morse, 2000). Depending on what research methods have been employed, and some other important factors such as scope of study, nature of the topic, and quality and amount of the data obtained per participant, different sample sizes might be suggested for qualitative data collection methods (Morse, 2000). For instance, for a phenomenological study usually six to ten interviews are recommended and for a grounded theory study twenty to fifty participants are recommended (Teddlie, 2009).

The sample size is perceived to be appropriate and adequate for a qualitative study as long as it adequately answers the research question (Marshall, 1996). In

other words, sampling must be continued until complete explanation of the phenomenon or saturation of the concepts is achieved. However, it is important to ensure that the data is saturated rather than the participants (Morse, Barrett, Mayan, Olson, & Spiers, 2002). Jansen (2010) differentiates between saturation in a grounded theory study, which tries to cover all theoretical possibilities in detail, and saturation in a qualitative survey, which attempts to cover all relevant diversity in a given population.

Generally, a reasonable sample size for qualitative sampling is considered to be between fifteen to thirty interviews (Bertaux, 1981 as cited in Guest, Bunce, and Johnson, 2006; Teddlie, 2009). Guest et al. (2006) also found in their examination of actual sample size to achieve data saturation that saturation occurs within the first twelve interviews. Therefore, considering the limitations of time and resources, the sample size for the study was initially estimated at an average of the abovementioned cut-offs, in other words, at about twenty to twenty-five participants. However, as mentioned, interviewing was continued until the data was replicated and nothing new emerged.

In practice, data saturation was achieved in the analysis process at about interview number seventeen or eighteen. However, to ensure that saturation was truly and completely achieved, data collection and analysis continued up to twenty-four interviews. See Section 3.7 on data analysis and Chapter 4 about the findings of the study for more information on this issue.

Several strategies such as contacting physician-only social networks, word of mouth announcements, and contacting physicians directly on blog or Twitter spaces were examined to access the population of the study and to recruit study participants. Of these, contacting physicians on social media channels such as Twitter and blogs was the most feasible and used predominantly to recruit the participants of the study.

For this purpose, first a list of physicians, who were found to be active on social media spaces, was compiled and these physicians included those who had a medical blog, contributed to medical Wiki articles, or participated in Twitter conversations. Additionally, the most popular medical Twitter hash tags were collected by searching the Internet. Next, potential participants were contacted either by sending an email or a direct message to their Twitter accounts. Twitter was also extensively used to announce the call for participation. Twitter messages were sent

by embedding the most popular medical and healthcare Twitter hash tags such as #hcsm, #FOAMed, #doctors, #hcsmanz, #hcsmuk, et cetera. In announcements sent through Twitter or email, links to the registration form (see Appendix C) and the participation flyer (see Appendix D) were also included. An example of the Twitter message is provided below:

> *Interested doctors sought to participate in an interview on "social media & knowledge/expertise sharing" http://tinyurl.com/6v69g48 #hcsm, #doctors*

In addition, hundreds of messages were sent directly to the doctors' personal Twitter accounts to invite them to participate in the study. For this purpose, physicians who were following those popular medical hashtags as well as doctors who were very well-known on social media channels were first identified and then sent invitation messages to their Twitter accounts. Compared to delivering the announcements using public medical Twitter hashtags, this approach seemed more helpful in recruiting potential participants.

The messages and announcements on Twitter attracted some physicians to participate in the study. Some volunteer participants registered their interest using the already designated online registration form (see Appendix C). Some asked for more information, some helped in the circulation of invitations by re-tweeting the messages to their followers, and some recommended other interested participants. In general, this strategy helped to recruit around fifteen participants for the study. Nine further participants were recruited through the recommendations made by those fifteen interviewees (snowball sampling).

3.6 DATA COLLECTION

Data collection, to obtaining information to answer the research question, is an important part of every study. Depending on the research methods employed in the study, data collection technique(s) might also be different. As discussed in the previous sections, this study adopted a qualitative approach and a qualitative survey design. Qualitative data collection includes observing, interviewing, and analysing documents or audio-video materials (Creswell, 2009). For the purpose of this study, interviewing, in particular semi-structured interviewing, was decided to be appropriate for the data collection. The rationale for choosing the semi-structured

interview, designing the interview guide, and the approaches taken in the data collection will be discussed below.

3.6.1 Semi-structured interview – rationale

Qualitative surveying can be carried out through questioning either by using an open-ended questionnaire or interviews (Dudley, 2010; Jansen, 2010; Warschauer, Knobel, & Stone, 2004). The current study is an example of an exploratory study using interpretive paradigm. Such an exploratory study might be well served by semi-structured interviews, which provide the researcher opportunities to ask participants for a detailed account and explanation of their opinions and experiences (Saunders, et al., 2009).

In addition, researching tacit knowledge sharing, which is a highly complex concept, requires an in-depth understanding of the phenomenon to yield a variety of perspectives and experiences. Such an understanding can be achieved through conducting semi-structured interviews rather than administering open-ended questionnaires. Open-ended questionnaires may raise issues such as misunderstandings about the concept being studied and result in incomplete responses (Saunders, et al., 2009). Therefore, semi-structured interviews were deemed to be a more efficient and effective way of gaining answers to the research questions than open-ended questionnaires.

Furthermore, semi-structured interviews are suggested for situations where the researcher does not have more than one chance to interview the study participants (Bernard, 2000). The target population of this study were physicians who are usually busy and getting access and involving them in a non-medical study is not always easy. Therefore, semi-structured interviews were chosen for the data collection.

3.6.2 Developing the interview guide

The development of an interview guide is an essential part of conducting semi-structured interviews for data collection. The interview guide directs the interview process, ensures that all important topic areas are covered, and helps to manage time effectively during the interview (Marschan-Piekkari & Welch, 2004).

The qualitative survey design employed in the study allows for flexibility in developing the interview guide, and also in designing and ordering the interview questions, although having a logical order is recommended (Dudley, 2010). In

addition, a qualitative survey does not always require asking exactly the same question of every participant. The unique dynamic and specific circumstances of each interview may require different questions and approaches to interviewing (Dudley, 2010). The ultimate goal of a semi-structured interview is to encourage participants to talk freely and give detailed information about the topic. Using an interview guide helps to achieve this purpose more easily (Fink & Oishi, 2003).

The interview guide for the study (see Appendix E) presents a list of interview questions which were asked of the study participants regarding the main research question. The questions were revised and modified after conducting a pilot study (see Appendix F) and also during the first interviews to ensure the relevance, clarity, simplicity, and unambiguity of the questions (Yaghmale, 2003).

As shown in the interview guide (see Appendix E), the interview questions were divided into four categories:

1. After welcoming the participants and providing brief information about the research and the interview, the first group of questions (questions 1 and 2) were introductory questions to ensure that the participants met the criteria that had already been defined for participating in the study. These questions were about participants' job, age, types of social media tools used regularly, and their reasons of using those tools. These questions also helped to answer parts of the objective number four of the study, presented in chapter 1.

2. The second group of questions (questions 3 and 4) was about the nature and types of knowledge and information physicians usually share on social media. These questions helped to respond the objective number one of the study (see chapter 1) and served as an introduction for asking for further information about the potential contribution of social media for tacit knowledge sharing. The responses to these questions also revealed that there are sufficient instances of tacit knowledge sharing among physicians on social media.

   A series of probing questions were also asked of the participants, if necessary, to encourage them to articulate their experience of when and how they used social media tools to share tacit knowledge. For this

purpose, several examples of tacit knowledge such as personal clinical experiences, new ideas, problem solving, clinical tips, and insights were included in the questions to convey the meaning of tacit knowledge and also provide the participants more opportunities to express their views of their experience.

3. The third category of interview questions (question 5 and its sub-questions) was intended to further the understanding of the potential contributions of social media in facilitating tacit knowledge sharing among physicians, the objective number two of the study (see chapter 1). Previous questions (category two) helped to reveal some contributions of social media to tacit knowledge sharing. These questions (category three) actually were complementary to those questions. These questions were prepared with some open questions to capture participants' perspectives and experiences regarding tacit knowledge sharing via social media. In the second phase, the questions were narrowed down using several probing questions, if necessary, to see how specific features and types of social media may help in facilitating tacit knowledge sharing.

   The primary source of developing these probing questions was literature. For this purpose, a series of probing questions were developed, based on the assumed relationships between enabling conditions and mechanisms of tacit knowledge sharing and social media concepts and features. Examples of these relationships were discussed above in Chapter 2, *Literature Review* (Section 2.8). For example, the literature review showed that practice observation, imitation, and demonstration are one of the best methods to transfer tacit knowledge. Accordingly, the participants were asked whether social media channels (for example, YouTube) provided such opportunities to share their knowledge.

4. The fourth category of interview questions was about challenges that the participants experienced in using social media for knowledge sharing purposes. These questions were designed to answer parts of the objective number four of the study (see chapter 1). In addition, the participants were asked to explain the differences between experiential knowledge sharing on social media and face-to-face sharing. Finally, the interview questions

were concluded by asking participants to express and reveal anything else of importance for facilitating medical tacit knowledge over social media. Participants were also asked whether they could recommend any other informant for the study.

After preparing and finalising the interview guide, potential participants were invited to participate in the study. The following section provides detailed information about the conduct of the interview.

3.6.3 Conducting semi-structured interviews

Semi-structured interviews might be carried out using one of several methods such as face-to-face interaction, interaction over the telephone, or the Internet. Telephone and Internet-mediated interviews have potential advantages of high response rates, speed, access, and lower cost, while face-to-face interviews have the potential of yielding richer data (Saunders, et al., 2009). Since it was anticipated that the study participants would be available and accessible in different ways, a combination of those approaches was initially entertained. However, in practice, most interviews were conducted via Skype and a few over the telephone. None was conducted face-to-face.

For the purpose of data collection, first an online registration form (see Appendix C) was created to collect participants' information such as name, gender, country, specialisation, years of job experience and contact details. On the registration form, a link to further information about the study as well as information about ethical clearance was also included. The information entered by the study participants on the registration form ensured that participants met some of the criteria (e.g. sufficient clinical experience) required for participating in the study in the first place. Participants who did not meet the criteria for participating in the study were sent an email explaining why they could not be accepted.

Next, as explained in Section 3.5, a number of purposefully selected participants, as well as any informants recommended by them, were initially contacted via sending emails or Twitter messages and invited to participate in the semi-structured interview. In every invitation to physicians to participate in the study, a link to the registration form was provided to allow them to obtain further

information about the study and if interested to register their details for a semi-structured interview.

Upon the registration of participants, another email was sent to them to provide further information about the research, the requirements and criteria for participation, and also how participants' confidentiality would be protected. The main interview questions and working definitions of the main terms used in the interview were also attached to the emails sent to the registered participants. Finally, through follow-up emails a suitable time, place, and a favourite way of conducting the interview (for example, via Skype or phone) was confirmed by both study participant and researcher.

On the day of the interview, following the interview guide, explained in the previous section, the participants were challenged by being asked a series of prompts and follow-up questions to obtain a detailed understanding of the context and the process of using social media for experiential and tacit knowledge sharing.

Interviewing was begun in December 2011 by conducting two pilot interviews and was finished in August 2012. Each interview session last approximately forty to sixty minutes and was recorded using an MP3 Skype recorder with the permission of interviewees. The transcripts of interviews were sent back to the participants before data analysis to be revised by them if necessary. All comments and responses were treated confidentially, in other words, no names, addresses, or any other identifying information was stored or reported as part of the findings of the study.

3.6.4 Limitations of data collection

The study had some limitations in terms of using a semi-structured interview for the data collection. One of the main issues was related to the recruitment administration and getting access to the study population. Physicians were found to be very busy people and involving them in a non-clinical study was not easy. However, through the help of social media tools (particularly Twitter) and also through employing snowball sampling, access to the study population was improved. Despite this, the process of recruiting participants was still quite time consuming and the appointment for an interview needed to be re-arranged several times before finally being able to conduct the interview.

For example, around one third of physicians who registered and showed their interest in participating in the study were tardy in responding to emails, messages sent via Twitter or Skype or to phone calls to arrange the interview. Eventually, some withdrew from the study and some were eliminated from the study due to the fact that they did not respond the messages. In many instances, interview times were booked several months in advance and re-arranged several times before finally being able to conduct the interview. Some participants mentioned that they were not able to spend more than thirty to forty minutes on the interview, and so the researcher needed to manage time effectively to obtain appropriate information.

On the other hand, finding the right participant who used social media on a regular basis (at least twice a week) and also had sufficient clinical experience (minimum five years) was even harder. Although physicians have recently become interested in joining social media, their level of use was found not to be as much as by people in business or universities. In fact, some participants were not recruited to this study because of their limited engagement with social media tools or their limited clinical experience.

Another limitation in conducting the interview was the language of the researcher. Since English was the second language of the researcher there were cases of misunderstanding or missed opportunities to further probe participants' responses. However, with the help of a supervisory team who reviewed samples of the first interviews, and with more interviews being conducted, the researcher's interview skills also developed which led to him asking more appropriate probing questions.

A final limitation of the data collection was related to conducting the interviews mainly over Skype. Due to the limitations of the Internet connection and in order to have a high quality audio recording, most interviews were conducted without a face-to-face connection (either online or offline). Missing non-verbal cues was perhaps the major disadvantage of conducting interviews through Skype audio calling.

In spite of these limitations, the semi-structured interview enabled the researcher to obtain first-hand knowledge of participants' perspectives on and experiences of using social media for medical tacit knowledge sharing. The use of open-ended questions followed by probing and follow-up questions allowed for richer data to be obtained and a better understanding of the phenomenon.

3.7 DATA ANALYSIS

Data analysis is a critical step in a qualitative study that entails organisation, examination, interpretation and sense-making of the data, and also reporting the findings in an easily understandable format (Gorman, Clayton, Shep, & Clayton, 2005). Based on the research design, problem, and its purpose, a variety of data analysis approaches are available for a qualitative study. Some of the most common data analysis procedures suggested for qualitative data include: data display and analysis (Miles & Huberman, 1999), template analysis (King, 2004), grounded theory approach (Corbin & Strauss, 2008), thematic analysis, analytic induction, discourse analysis, and narrative analysis (Bryman, 2012; Saunders, et al., 2009).

In spite of the diversity of data analysis methods, most share common features such as summarising, categorising, and structuring of meanings in practice (Saunders, et al., 2009). It is recommended that the researcher not constrain her/himself to a limited type of analysis in a qualitative study, but instead to employ a combination of analysis approaches since this can enhance the quality of interpretations and findings (Creswell, 2009).

As discussed above, depending on the research design and methodology employed in the study, different types of qualitative data analysis might be employed. The research design employed in this study was a qualitative survey and the data collected was qualitative data obtained in semi-structured interviews. Content analysis is the method most commonly suggested for analysing qualitative survey data (Fink, 2003). Initially content analysis was defined as "any technique for making inferences by objectively and systemically identifying specified characteristics of messages" (Holsti, 1969, p. 14). However, the definition has changed over time as most researchers have attempted to also incorporate subjective and qualitative interpretations into this method (Graneheim & Lundman, 2004; Mayring, 2004). As Patton (2002, p. 453) states, content analysis is currently used more generally to encompass "any qualitative data reduction and sense-making effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings".

Content analysis might be carried out either quantitatively, for instance by counting the frequency of occurrence of certain words, phrases, or concepts in the data, or qualitatively, which entails coding concepts and organising data into

emerging themes and conceptual categories (Elo & Kyngäs, 2008; Hsieh & Shannon, 2005). The latter is also known as thematic content analysis when the data are analysed solely qualitatively (Joffe & Yardley, 2004; Sutton & David, 2011).

Thematic analysis is a method that can be used in almost all qualitative data analysis. It is a method that primarily seeks to identify, categorise, and report patterns of experience and important concepts and meanings within a data set. It may also introduce an overarching model that unites the core patterns (Boyatzis, 1998; Braun & Clarke, 2006).

Since the aim of the present study was not to quantify concepts but rather to explore and identify emerging concepts in regard to the main research question, thematic analysis was chosen in accordance with the interpretive perspective to analyse the collected qualitative data. In other words, the interview data was analysed inductively to demonstrate social media potentials and contributions in facilitating tacit knowledge sharing according to physicians' experiences and perspectives.

3.8 THE DATA ANALYSIS PROCESSES

The rationale for employing thematic analysis was explained in the previous section. This section describes the steps followed in conducting the thematic analysis in the study. Adhering to the guides suggested by several authors such as Braun & Clarke (2006), Boyatzis (1998), Creswell (2009), Zhang & Wildemuth (2009), Ryan & Bernard (2003), Bryman (2012), and Bazeley (2009), four general stages and ten specific steps were identified and followed to perform thematic analysis in the study: The stages, as shown in Figure *3.1*, included: preparation, coding, themes identification, and reporting. Each stage is explained in the following sub-sections.

3.8.1 Stage one: Preparation

The first stage in the thematic analysis includes preparation of the data for analysis. This includes three steps: transcribing the interview, planning for storage of data, and familiarisation with the data.

Transcribing the interview: Digitally recorded interviews were transcribed verbatim (keeping a verbal account of the interviews) to ensure that no important

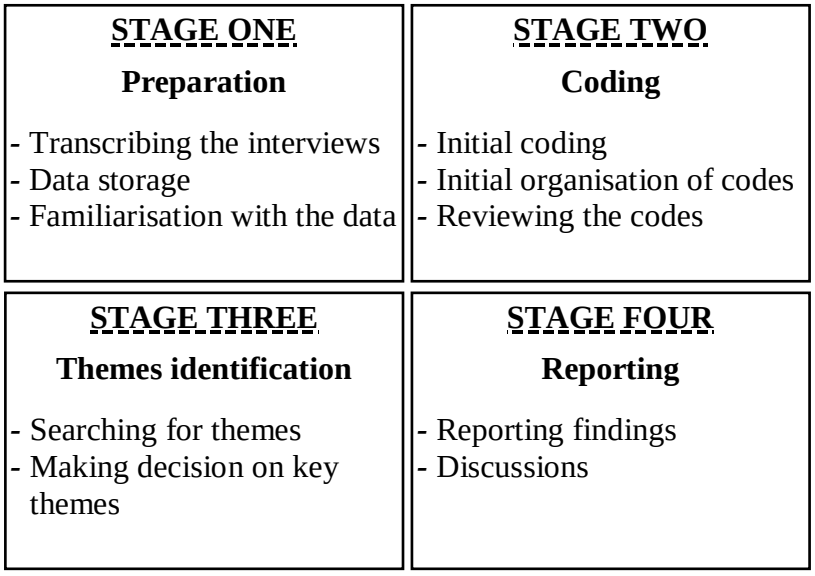

Figure 3.1. Thematic data analysis steps.

Sources: Boyatzis, 1998; Braun & Clarke, 2006; Bryman, 2012; Creswell, 2009; Ryan & Bernard, 2003; Zhang & Wildemuth, 2009

information was missed. Next, the transcripts, together with copies of their audio files, were sent back to the participants with a cover letter asking them to review the transcripts and correct them if they found any errors in the transcription or anything missing. Participants were also given an opportunity to provide additional comments if they wanted. However, the response rate was rather low. Only six of twenty-four participants returned edited versions. To improve the accuracy of transcription, help was also sought from native English speakers where problems were noticed in the transcription process, particularly when participants did not reply to the requests for reviewing the transcripts. These processes served as an initial member checking for the accurate representation of the participants' views.

***Data storage*:** The edited and verified versions of transcripts were stored in a computer system with password protected access to ensure that the data was not accessible to third parties due to ethical considerations. To facilitate this process, well-known qualitative data analysis software (NVivo version 9), was used. In addition, all personal information of participants such as their names and the organisation they belong to were removed or encrypted using numerical codes.

***Familiarisation with the data*:** Early familiarisation with the data began while transcribing the interviews where audio files of interviews were listened to repeatedly to transcribe the interviews and catch the meanings. Next, the transcripts were read two to three times to be fully immersed in the data and to obtain a

thorough understanding of the data. Initial notes were made after each interview transcription to help developing ideas related to the data. To facilitate this process, a memo was created for each interview using NVivo software to document annotations and thoughts about each interview.

3.8.2 Stage two: Coding scheme

The second stage in the thematic analysis includes coding the data. The coding process involves initial open coding, initial organisation of codes, and reviewing and modifying codes.

Initial Coding: Initial open coding was conducted concurrently with data collection and after familiarisation with the data by careful line-by-line reading of the interview transcripts. Expressions of an idea in any part of the interviews regarding research question were considered as unit of data analysis. Using NVivo version 9, the codes were first created and then any instances from the interview data which could be considered as an example of the created code were referenced to that code (see Appendix G for an example of coding the interview text). The processes of reading and coding were continued until no new codes were found in each transcript. Generally, each interview was read three to five times during initial coding.

Both manifest coding (analysing the actual words used by participants, also called in-vivo codes) and latent coding (analysing underlying implicit meanings of the data in relation to the research question and the theory) were used in creating new codes (Boyatzis, 1998). However, to minimise bias, in the first stages open coding was primarily carried out based on what emerged from the data without linking the coding to prior theories.

Making a decision on whether to analyse deductively (theory-driven) or inductively (data-driven) is an important decision in thematic analysis (Boyatzis, 1998; Braun & Clarke, 2006; Elo & Kyngäs, 2008). This study primarily utilised an inductive approach to see what emerged originally from the data. However, in searching for key themes the literature was also consulted, that is, deductive analysis was also employed in the study. Examples of these theory-driven codes which influenced the study findings were already discussed in Section 2.5 in Chapter 2. Full list of these codes are also listed in Appendix A.

Coding consistency was also checked by examining samples of codes applied to the interview texts and discussed with the supervisory team to ensure that the codes were reliable and truthful. The list of initial codes is provided in Appendix H.

Initial organisation of codes: The initial organisation of codes was carried out while performing initial open coding. Whenever prospective initial broad categories were noticed that could have grouped the codes with similar content and features, they were documented during the coding process. In other words, those initial open codes which had similar features were grouped into higher order categories. For example, it was noticed that several codes, such as chatting, talking with other physicians, and immediate feedback, could be moved to a broader category such as dynamic conversation. The identified broad categories were named according to their content.

Reviewing the codes: The initial processes of open coding and organisation of codes resulted in creating an initial hierarchical structure of codes and categories. In this phase, the codes created and the overall structure were reviewed to determine whether the codes were located in the right places. As a result, several codes were moved to new places, merged with other similar codes, irrelevant codes were deleted, others were modified, and overlaps were removed. An edited version of the codes structure is provided in Appendix I. "Memos" were created throughout the project to record personal comments and ideas about the findings of the study as well as to document the process of data analysis.

3.8.3 Stage three: Themes identification

The third stage in the thematic analysis deals with identifying key themes of the study. It included two steps: searching for themes and making decisions on key themes.

Searching for Themes: Themes in thematic analysis generally refer to abstract constructs or broad categories that conceptually link expressions found in the data (Ryan & Bernard, 2003). Themes are patterns in the data that explain and organise "the possible observations" and "aspects of the phenomenon" (Boyatzis, 1998).

The process of identifying themes in the study was begun with transcribing interviews where the emerging prospective themes were documented in the memo for each interview. The codes and categories that had emerged in previous steps were

reviewed and challenged multiple times against the main research question, "social media potential to support tacit knowledge sharing", to determine the main themes of the study.

First, codes from different areas were combined to form some tentative overarching themes. Next, keeping the main research question in mind, the transcripts were reviewed again in case there were any further references to the themes or any new themes had emerged from the data. Tacit knowledge sharing theories were also consulted in creating main themes at times. The themes emerged by employing both "data-driven" and "theory-driven" approaches (Braun & Clarke, 2006). No limitations were imposed at this stage in terms of scope, significance, or number of themes or sub-themes.

Making decisions on key themes: After identifying initial themes in previous steps the process of making decisions on key themes of the study was begun. Following Ryan & Bernard's (2003) recommendations, several techniques were employed in identifying the major themes of the study:

Similarities and differences: Categorising concepts based on similarities and differences was the main strategy used in the process of identifying the main themes. Subsequent to initial identification of themes, the constant comparative technique (Corbin & Strauss, 2008) was also utilised to compare and contest data at different levels. First, candidate themes and sub-themes were reviewed individually by examining their collated extracts. In other words, all extracts of each theme were separately read and scrutinised to determine whether they really formed a coherent pattern. Next, each theme was reviewed in relation to the entire data set to ascertain how meaningful they were in relation to other themes and how they matched with each other for accurate representation of the phenomenon under study (Braun & Clarke, 2006). The modified themes were also compared to each other using the constant comparative technique to discover similarities, differences, and relationships between them. Finally, the themes were weighted according to their significance, relevance to the research question, and distinctiveness to be included as one of the most important and fine-grained themes of the study.

Theoretical link: Themes can emerge both from the data and the theory (Bazeley, 2009; Ryan & Bernard, 2003). Salient themes were chosen according to their strong link to theories related to tacit knowledge sharing. This ensured that the

data was properly connected to the main questions of the research. This was approached by searching the data for evidence and examples of tacit knowledge, which were already discussed in the literature, and exploring how they are shared in the context of social media. In spite of following an inductive approach in coding, identifying major themes was done by balancing findings from the data and the theory, with broader themes mainly borrowed from the literature in the area of face-to-face tacit knowledge sharing, examined in the data and modified to social media context. This had already been predicted as the purpose of the study was to see how far social media can help in different aspects of face-to-face tacit knowledge sharing. This implies that there might be overlap between the themes of two contexts, face-to-face and social media. However, this means that the more overlap there was between the two, the more potential social media has to facilitate tacit knowledge sharing.

Repetition: Another factor that to some degree was considered in choosing the main themes of the study was to see whether there was sufficient support from the data in relation to the identified themes. Although frequency of occurrence of codes in the data was not viewed as important as the two other factors mentioned above, without sufficient support from the data developing an in-depth discussion about them would not be possible. Therefore, topics with high frequency were initially chosen to be included in the main findings of the study and topics with less frequency remained for further analysis. As a result, codes and categories that were rarely reported as potentials of social media in facilitating tacit knowledge sharing were discarded from the analysis due to lack of data support for developing a meaningful discussion. Final decisions were made by trading off between quantitative counts and qualitative importance.

A combination of the above strategies was used to identify the major themes of the study. The existing codes and themes were remixed, refined, recoded, new ones generated, or irrelevant themes and sub-themes discarded whenever it was required, even during the reporting of the findings of the study. This phase was ended by making a decision on certain representative themes which posed a maximum "internal homogeneity and external heterogeneity" in regard to answering the main research question (Braun & Clarke, 2006).

3.8.4 Stage four: Reporting findings and discussions

Reporting and discussing the results is a critical phase in carrying out a qualitative analysis. It involves exploring the characteristics and dimensions of the themes identified, uncovering the relationships and patterns among them, and reporting the findings using standard and sense-making formats. The result of a thematic data analysis might be simply a list of themes describing the phenomena or a complex model illustrating the identified themes and their relationship using a thematic map (Boyatzis, 1998). This study will not only introduce the identified themes of the study but also explore the potential relationships among the themes to present them in a conceptual map of themes.

The write-up of the findings of the study was begun from the early stages of data analysis when descriptions about each node, annotations about each case, and suspected pattern of relationships were documented in memos in the NVivo software. The themes were reported following the "Describe-Compare-Relate" recommendation of Pat Bazeley (2009). Each theme's characteristics and boundaries were first described, then differences and similarities across variations in context were discussed, and finally potential relationships among the themes were proposed. The scope and content of each theme was initially defined according to the common characteristics of its sub-themes, supported by example quotations from the data. At times further refinements of the themes were made while defining them.

Finally, using the memos recorded during the analysis as well as the help of the literature, further analysis was performed to determine the relationship among themes to represent a thematic map, a conceptual map of the themes identified in the study. The thematic map is defined as "an overall conceptualisation of the data patterns, and relationships between them" (Braun & Clarke, 2006, p. 89). A complicated story of the findings and the conceptual model developed will be presented and discussed in subsequent chapters.

Interpretive findings from the qualitative analysis of the study were reported using known formats such as typical quotations, charts, graphs, conceptual frameworks, hypotheses for future research, and so forth. The data analysis was closed by discussing the results in relation to the research questions as well as the past literature, presenting the questions raised for future works, acknowledging the limitations of the study, and proposing practical recommendations.

3.9 TRUSTWORTHINESS

The assessment of the quality and trustworthiness of the findings is an integral part of every qualitative design. Different verification strategies and criteria are recommended for evaluation of a qualitative inquiry and to ensure the accuracy of qualitative interpretations and findings. Such an evaluation could be made from the perspective of the researcher, the participants of the study, and the audience (Creswell, 2009).

The most common assessment method used for a qualitative inquiry follows Lincoln & Guba's (1985) approach. Lincoln & Guba proposed four factors for assessing a qualitative study: credibility, transferability, dependability, and confirmability. These are correspondingly equivalent to internal validity, external validity and generalisability, reliability, and objectivity in quantitative methods. According to Lincoln & Guba (1985), credibility can be achieved through prolonged engagement, persistent observation, peer debriefing, triangulation of data, collecting and establishing referential adequacy materials, member checks, and establishing structural coherence. Transferability can be assessed by collecting and developing thick descriptive data and theoretical and purposive sampling. Dependability can be enhanced through using overlap methods, using stepwise replication, and audit trial. Finally, confirmability can be accomplished through triangulation of data and audit trial.

Fossey, Harvey, McDermott, and Davidson (2002) also classified the criteria required for assessing the quality of qualitative inquiries into two main categories: criteria related to methodological rigour, and those related to interpretive rigour (trustworthiness of interpretations). They specified example criteria for each category. For methodological rigour they suggested criteria such as congruence of research design, responsiveness to social context, sampling appropriateness, sampling adequacy, and transparency of data collection and analysis. For interpretive rigour, they also recommended criteria such as authenticity and coherence in presentation of findings and interpretations, reciprocity (member checks), typicality (generalisability of findings) and permeability of the researcher's intentions, engagement, and interpretations.

Morse, et al. (2002) also emphasised methodological coherence, sampling sufficiently and appropriate recruitment, concurrent data collection and analysis,

thinking theoretically, and theory development for the verification of qualitative research.

Finally, Creswell (2009), adopting Lincoln & Guba's strategies, recommended criteria such as triangulation of data, member-checking, using rich and thick description, clarifying bias, presenting negative or discrepant information, spending prolonged time in the field, using peer debriefing, and an external auditor for examining the trustworthiness of the findings of qualitative research.

Obviously, none of the criteria discussed above are equally significant or applicable to every qualitative design (Fossey, et al., 2002). To assess the quality of qualitative findings, it is recommended to identify and discuss strategies that are available (Creswell, 2009). Generally, it is advised that the verification of a qualitative study must be established during the study rather than be a post hoc evaluation (Morse, et al., 2002). Therefore, to evaluate the current study, Fossey et al.'s (2002) classification of evaluation criteria (in other words, methodological rigour and trustworthiness of findings) was first adopted. Then, criteria suggested by other authors, for example Lincoln and Guba (1985) and Creswell (2009), were included and discussed within the two broad categories suggested by Fossey et al. (2002). Table 3.4 (see next page) shows which strategies were used and which were not used to ensure the trustworthiness of the study with regards to data collection and analysis processes.

To ensure methodological rigour, first the rationale for choosing the research design and its congruence with the research questions was discussed thoroughly in the early sections of this chapter. Second, transferability and representativeness of the sample and settings were accomplished by employing a purposive sample of physicians based on the criteria defined in the study for selecting appropriate and an adequate number of participants that represented a broad range of the population of the study. Third, the appropriateness and the transparency of the data collection and analysis methods and processes were discussed with the supervisory team and discussed above in this chapter. Fourth, interview questions were tested in a pilot study to ensure the suitability and clarity of questions. Lastly, data collection and data analysis were conducted almost concurrently. The initial analysis of each interview helped to improve subsequent interviews in the data collection process.

Table 3.4

Strategies to Ensure Trustworthiness of Qualitative Research

	Verifications Strategies for Qualitative Research	Data collection	Data analysis
Methodological rigour	- Congruence of research design	√	√
	- Sampling appropriateness	√	N/A
	- Sampling adequacy	√	√
	- Data collection and analysis transparency	√	√
	- Prolonged engagement	×	N/A
	- Triangulation of data	×	×
	- Concurrent data collection and analysis	√	√
Interpretive rigour	- Investigator responsiveness	√	√
	- Referential adequacy	×	×
	- Audit trial	√	√
	- Rich and thick description (authenticity in presentation of findings and interpretations)	N/A	√
	- Presenting negative or discrepant information	N/A	√
	- Coherence (fit of the data to the findings)	N/A	√
	- Member checks	√	√
	- Inter-coder reliability	N/A	√
	- Clarifying the bias	√	√
	- Peer debriefing/review	√	√
	- External auditor	N/A	√

√ Strategy used to enhance rigour of the study
× Strategy not used to enhance rigour of the study
N/A Strategy not applicable to the stage of the study
Sources: Creswell, 2009; Fossey, et al., 2002; Lincoln & Guba, 1985; Morse, et al., 2002

First, in terms of demonstrating the trustworthiness of the findings, the researcher remained reflective and sensitive to each interaction found in the data analysis, and the decisions and interpretations made in the interest of conducting rigorous research as far as possible.

Second, as recommended by Ryan & Bernard (2003), a demonstration of validity can be achieved by maximising the clarity and explicitness of judgements made during the analysis and outlining the details of the techniques used by the investigator. Lincoln & Guba (1985) call this process referential adequacy. To achieve this purpose, detailed records of the data analysis process including decisions made throughout the project (keeping an audit trail) were kept and systematically and constantly reviewed to ensure the dependability and consistency of the findings.

Third, it was attempted to present and support findings of the study using the participants' own language by quoting a range of examples of their opinions and experiences to increase the authenticity of discussions and findings.

Fourth, negative cases were also analysed and reported to give a thick description of the phenomenon, as provided in the findings chapters, particularly

when the challenges of using social media were presented. In total, the researcher did his best to support the findings with examples drawn from the data collected, by supporting the arguments with real data (both positive and negative cases) and also linking them with the theories described in the literature.

Fifth, member checks with participants during the data analysis processes were also sought. Seeking respondents' opinion to examine and verify the themes and concepts identified in the study is another way to maximise the validity of findings (Ryan & Bernard, 2003). For this purpose, a copy of the interview transcripts was emailed to each participant to check and edit them, although the response rate was fairly low. In addition, a copy of the preliminary findings presented at an international conference was also emailed and tweeted to the participants of the study as a way of obtaining their verification of the results. Some participants responded to the messages with a few comments and others only distributed the paper among the community. Although the response rate for member checking was low, to some degree it ensured that the interpretations made by the researcher are accurate representations of participants' perspectives and experiences.

Sixth, intercoder reliability, that is, "the degree to which coders agree with each other about how themes are to be applied to qualitative data" (Ryan & Bernard, 2003) or establishing agreement among research team members is another way to increase the validity of findings. For this purpose, one of the supervisors coded samples of the interviews. Next, the codes assigned by the researcher and the supervisor were compared and discussed until agreement was reached. This helped to increase the consistency and validity of coding. However, this process could be even more rigorous if it were done involving more than two people.

Seventh, biases either in sampling and data collection or in data analysis were reported whenever possible. Finally, credibility was achieved by asking panel experts to review samples of the data collected and the analysis process and the interpretations made, and to critique and challenge the researcher's assumptions about the data. The supervisors acted primarily as peer debriefers/reviewers while external experts acted primarily as auditors. Their comments and critiques aided the researchers in his assessment of both the credibility and the confirmability of the findings and conclusions.

3.10 THE RESEARCHER ROLE AND BIASES

Defining the role of the researcher is a fundamental component of a qualitative study, as the researcher is heavily involved in data gathering and analysis processes throughout the study. The researcher in this study is an international PhD student at Queensland University of Technology (QUT), Brisbane, Australia, who had no particular relationship with the participants. The researcher did not contribute to the study as a participant. The researcher's main role in data collection was to recruit appropriate participants, and set up and manage the interviews as described in the interview guide. The researcher attempted to employ the most suitable cases for the interview for as long as possible, based on the criteria defined in Section 3.4. During the interview, the researcher welcomed participants warmly, and introduced the research team (the researcher and supervisory team) and the study objectives before asking the main questions of the interview.

Researcher bias is almost inevitable in a qualitative study, due to the subjective and interpretive nature of the study. However, to avoid bias (interviewer bias) during the data collection, the researcher did not contribute to the participants' responses in any form, be it by way of comment, tone, or non-verbal behaviour that may have caused bias, unless there was a need for clarification or probing for more detail (Saunders, et al., 2009).

The interview questions were reviewed and revised multiple times to be free of biased questions. In addition, sometimes questions were asked again from different angles during the interviews to minimise any bias or misunderstandings. However, in terms of probing for the types of knowledge that the participants shared on social media, since the interview questions were mainly about tacit knowledge sharing, the result is biased towards tacit knowledge sharing rather than explicit knowledge sharing. This can be justified by reviewing the research purpose and the main question, which aimed to investigate tacit knowledge sharing through social media rather than knowledge sharing in general. In addition, the study did not claim that tacit knowledge sharing occurs more frequently than explicit knowledge sharing on social media. The study solely shows the range of knowledge that physicians usually share on social media rather than attempt to quantify its importance (for more information see the discussion of types of knowledge shared on social media in Chapter 4).

Sampling bias is another important factor that needs to be monitored in a qualitative study. To reduce bias in sampling, the sample was recruited according to the purpose of the study and based on the criteria defined in the study for this purpose. However, there might be bias in sampling due to the announcements made on Twitter, inviting potential participants to participate in the study. The announcements on Twitter might have influenced recruiting participants that predominantly use Twitter rather than other types of social media. That is probably why the study found that Twitter was the social media tool most frequently used by the study participants.

To reduce any sampling bias that might result from the announcements on Twitter, a list of active users of other social media tools such as medical wikis and blogs was also compiled and potential participants contacted. Contacting users of some social media tools such as physicians' dedicated social networks was not easily possible for the researcher, as described in Section 3.5. In total, the response rate to invitations made by contacting users of medical blogs and wikis was much lower than the response rate to Twitter invitations. In addition, snowball sampling was employed to minimise sampling bias, which turned out to be the second most successful way of recruiting study participants, following Twitter announcements.

Finally, all data collection and analysis processes, and all observations and interpretations were monitored multiple times by the researcher, the supervisory team, and the panel of experts throughout the study to ensure that the approaches taken in the study were free of either the researcher's or the participants' bias.

3.11 RESEARCH ETHICS STATEMENT

Gaining ethical clearance prior to any actual data collection was one of the main concerns of this study. As the research involved human participation through semi-structured interviews, the level and details of the participants' involvement in the study, as discussed in this chapter, led to the following ethical considerations (Babbie, 2011; Creswell, 2009):

- Voluntary participation was respected at all levels of the study;
- A consent form was provided to every participant;
- Participants could withdraw from the study at any point of the study;

- Participants were assured that all information, comments and responses they shared with the researcher would be treated confidentially, that is, no names, addresses, or any other identifying information would be stored or reported in the study;
- Only the researcher would have access to the participants' data, and the audio files of interviews would be deleted at the conclusion of the project; and
- Findings of the study would only be used for the research purposes.

The study approach for the data collection and data analysis was reviewed by the Human Research Ethics Committee of the Queensland University of Technology and was considered a "Low Risk" study in accordance with the National Statement on Ethical Conduct in Research Involving Humans.

Chapter 4: The participants

4.1 CHAPTER PREVIEW

The previous chapter outlined the methodology adopted in the study, qualitative survey, and discussed the data analysis method employed, thematic analysis. This chapter presents some of the study findings responding in particular to objective two (exploring the patterns and nature of knowledge being shared among physicians on social media) and objective four (investigating the use of social media tools by physicians) of the study. The ultimate goal of the study was to investigate the potential contributions of social media tools in facilitating tacit knowledge sharing according to physicians' perspectives and experiences. To achieve the purpose of the study, the question of *"how does social media facilitate tacit knowledge sharing among physicians?"* was proposed as a main research question.

The data was collected using a semi-structured interview (conducted mainly over Skype and a few over the telephone) with twenty-four physicians across the world. The data was prepared for the analysis by transcribing the audio-recorded interviews into text documents and entering them into NVivo qualitative data analysis software (version 9). The data was analysed using the thematic data analysis approach, following the steps outlined in the previous chapter: preparation, coding, theme identification, and reporting findings. Using thematic data analysis, the data was scanned, coded, and reviewed multiple times to crystallise the emerging themes and categories.

The main findings of the study, the themes identified in the analysis, will be presented in the next chapter. This chapter provides parts of the findings that describe the demographic information of the participants, an overview of the coding information, social media tools used by participants, types of knowledge shared by physicians on social media, and the reasons for social media use by physicians. The chapter ends with a summary.

4.2 DEMOGRAPHIC INFORMATION OF THE PARTICIPANTS

This section provides an overview of the demographic information of the study participants. As described in Chapter 3, the participants were recruited through

snowball and purposive sampling as well as by disseminating announcements mainly on Twitter. In total, twenty-four physicians were interviewed for the purpose of the study, from December 2011 to August 2012. The process of interviewing was continued until it was noticed that nothing new emerged in the last interviews and relative data saturation had been achieved.

Figure *4.1* shows the demographic information of the participants according to their gender, age group, geographical location, specialty, and job experience. As shown in the figure, only a small percentage of participants (8%) was female while the majority was male (92%). The majority of the participants were in age groups from 31-40 years (54%), perhaps because of the fact that younger age engage in social media more prolifically, and 41-50 years (29%). The youngest participant was 32 and the oldest 63 years old. The average age of participants was estimated to be 42 years. The largest percentage of participants was from Australia (54%), followed by the United States (38%) and Europe (8%).

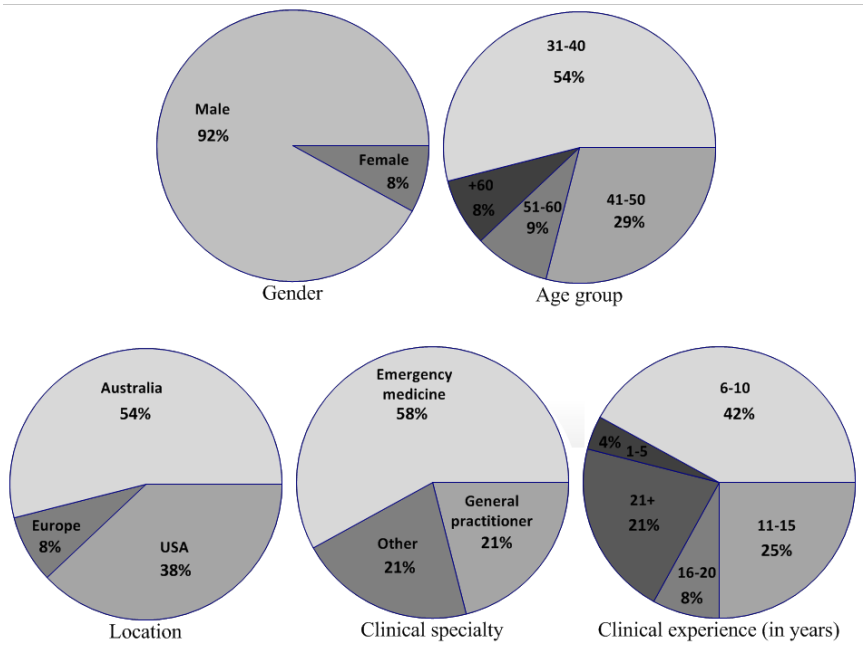

Figure 4.1. Demographic information of the participants (N=24).

In regard to the clinical specialty of the participants, emergency physicians were in the majority, constituting 58% of all participants. This might be because of the fact that the first participant interviewed for the study was an emergency physician and therefore, subsequent recruitment of participants might have been influenced by his and his colleagues' recommendations. The next largest group was general practitioners (GP), with 21% of participants. The remaining participants

(21%) were: one transplant surgeon, one oncologist, one geriatrician, one orthopaedic surgeon, and one immunologist.

Physicians who participated in the study had a minimum of 5 to a maximum of 40 years of clinical experience. On average, participants had 14.15 years clinical experience. The majority of participants (67%) had above 10 years clinical experience; hence, it can be argued that the majority of participants were senior physicians.

4.3 CODING INFORMATION

Coding of the data was begun as early as possible after the interviews had been transcribed, and familiarisation with the data was achieved either by listening to the interviews or by reading transcripts of the interviews multiple times. Following the steps described in Chapter 3, initial open coding was achieved by a careful and meticulous reading of the data. The codes were reviewed several times, modified, grouped, and re-grouped as coding proceeded and further understanding of the phenomenon was developed.

Table 4.1

Distribution of Codes During Each Phase of Coding and Where They Are Discussed in the Thesis

Categories	Initial codes	Modified codes	Final codes	Discussed in
Social media contribution to tacit knowledge sharing	71	44 (with 12 broad themes)	21 (with 6 broad themes)	Chapter 5
Types of knowledge	66	25	15	Chapter 4, Section 4.6
Tools used	51	33	33	Chapter 4, Section 4.4
Reason of use	45	24	10	Chapter 4, Section 4.5
Challenges	69	28	14	Chapter 5
Other	44	36	9	-
Total	346	190	102	-

Table 4.1 shows an overview of the codes that were allocated to the data during each phase of the analysis. Initially, about 346 open codes in total were derived from the data. The codes were reduced to 190 in the second phase of reviewing the codes, and finally, to about 117. Of these 117 final codes, 21 were related to the potential of social media for tacit knowledge sharing, which was the main interest of the study.

The distribution of the other codes was as follows: types of knowledge shared among physicians on social media (15 codes), reasons for using social media (10 codes), challenges of sharing knowledge on social media (14 codes), and type of social media tools used by participants as well as frequency of use (33 codes). In addition, there were few free codes that had little support in the data.

The number of codes stated in Table 4.1 is approximate as the coding process was interactive and continuous and keeping a record of all changes in the codes was not easy. The table also shows the number of broad categories identified during the analysis regarding the main research question, the contribution of social media to supporting tacit knowledge sharing. These broad categories and the twenty-one associated codes were the central part of the data analysis. More information about this will be provided in the next chapter when the themes will be introduced and discussed.

4.4 SOCIAL MEDIA USE BY PARTICIPANTS

One of the conditions of recruiting participants for the study related to the level of social media use by participants (using one of social media tools at least twice a week). Since the purpose of the study was to explore physicians' perspectives and experiences of tacit knowledge sharing on social media, it was important to ensure that participants had sufficient experience in social media space. Therefore, before exploring the data to help answer the main research question, it was reviewed to determine what kind of social media tools the participants used, and also how and why they used those tools.

There are a variety of social media tools available now on the Internet and physicians had tried some of these tools either for professional or personal purposes. However, according to the twenty-four physicians who were interviewed in the study, blogs and Twitter were the two main social media tools that attracted them. Almost all the physicians who participated in the study had used Twitter frequently and were involved in blogging. Social media use is defined here as using one or several social media sites regularly for authoring and sharing knowledge, engaging in discussions and commenting with peers, and also reading and keeping up-to-date.

Figure *4.2* shows an overview of the tools used by the participants of the study. As shown in the figure, twenty-two participants mentioned using Twitter regularly

and two participants used it occasionally. The participants preferred Twitter primarily because of its popularity among the clinical community and therefore, the attendance of a professional audience in the Twittersphere. Twitter was mainly used by the participants for staying up-to-date with advanced information and news in the field. According to the participants, the ability to quickly review advanced and peer-reviewed information, to stay up-to-date and keep abreast of what is going on in the field internationally, and also the ability to network and be part of the community were mentioned as the main advantages of joining Twitter.

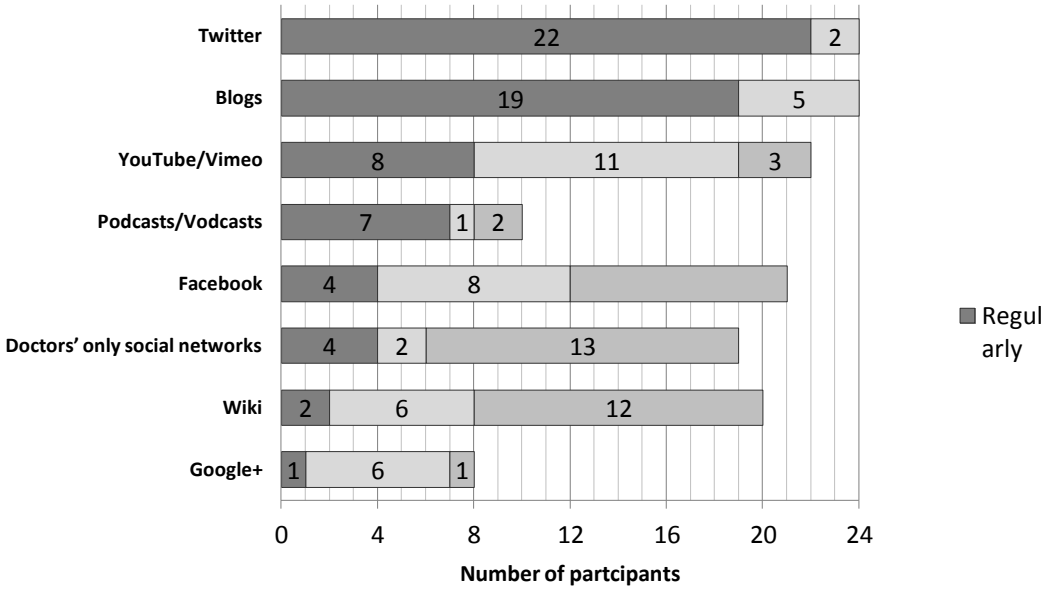

Figure 4.2. Frequency and types of social tools used by the study participants (N=24).

According to the participants, Twitter best suits physicians' needs in terms of keeping them up-to-date. Since the work of physicians usually means they are very busy, they have limited time to read and review traditional journals to keep up-to-date. However, Twitter's availability on mobile devices has enabled them to receive updated information very quickly, and they are able to review Twitter updates at a time of their own choosing or even during their work time.

Following Twitter, blogs were the main social media tools that the majority of the participants (19 out of 24) mentioned that they used regularly. Compared to Twitter, blogs were largely used for case reporting and case-based discussions, providing literature summaries, sharing clinical tips, introducing controversial topics, and developing in-depth discussions. The participants mentioned that the main advantages of using blogs were to provide adequate space for writing, the possibility

of commenting and developing discussions, and also the possibility of embedding multimedia files.

Multimedia sharing sites, such as YouTube and Vimeo, were the third main category of social media tools used by study participants. Comparing their use of blogs and Twitter, the majority of participants had used multimedia sites only occasionally. As was shown in Figure *4.2*, eight participants had used multimedia sites regularly, eleven occasionally and three had used them only rarely. The majority of participants preferred to view embedded links of podcasts/vodcasts shared on blogs rather than search for them directly on multimedia sharing sites. Multimedia components on social media were used mainly for demonstrating practical clinical skills, or for broadcasting advanced discussions that took place among experts about current issues and topics in the field, or for disseminating conference presentations.

Few participants had used wikis and social networks such as Facebook and Google+ regularly. The majority of participants found wikis technically difficult to use for authoring and contributing content. In addition, the anonymous nature of contributing on wikis had made the participants reluctant to use public wikis regularly. According to the participants, the lack of contributors' responsibility for the content they shared on wikis, as well as the lack of recognition by peers and the community, are the main disadvantages of anonymity on wikis. Despite these issues, a large number of participants acknowledged that they used Wikipedia when they needed to obtain quick information about a topic.

Social networks such as Facebook and Google+ were mainly used for personal rather than for professional purposes. The personal-professional conflict of interest and the lack of a professional audience were mentioned as the main reasons for not using public social networks. The participants did not mention the use of LinkedIn as a main communication tool. However, a search of their names on the LinkedIn website revealed that almost all participants had a LinkedIn profile.

Similarly, the study participants rarely used dedicated social networking sites for doctors. This was mainly due to the lack of a wider as well as a relevant audience, the inability to build personal branding, the discussion of administrative- and system-related topics on these platforms rather than clinical topics, and finally, the lack of awareness of the existence of such networks.

4.5 REASONS FOR ADOPTING SOCIAL MEDIA BY PHYSICIANS

Previous sections have mentioned the frequency and types of social media tools used by the study participants. In addition, the specific reasons for using each tool were briefly introduced. This section presents the main reasons for the study participants to use social media platforms, regardless of the type of tool.

Today, many organisations and professionals have adopted social media tools for different personal or professional purposes such as broadcasting, education, knowledge sharing, communicating with customers, or encouraging collaboration among team members. Physicians have also been attracted by the mainstream popularity of social media in society. Many physicians have now started to embrace most of the social media tools, either formally through their organisations or informally through personal use, and this has grown significantly in recent years (Antheunis, et al., 2013; Cooper, et al., 2012; McGowan, et al., 2012). The popularity and ubiquitousness of social media, and hence, the availability of a large audience, have provided better opportunities for physicians to share or obtain knowledge and insights in the social media space.

The physicians who participated in the study mentioned a variety of reasons for joining and using social media. As it was shown in Table 4.1, the thematic analysis revealed ten codes relating to the main reasons of using social media by the participants. These codes then were grouped into six main categories: staying connected with colleagues, reaching out and networking with the wider community, sharing knowledge, engaging in continued medical education, benchmarking practice, and branding.

Staying connected. The study participants mentioned that social media enabled them to stay easily connected with past and present colleagues. With the ubiquitous nature of social media, available anywhere and anytime, it is very easy to stay connected with peers. Social media had enabled the participants to become aware of their colleagues' work and projects by following their Twitter accounts or their blog posts. In addition, they were able to refer to their colleagues on social media for immediate questions, feedback, and assistance. The participants also mentioned that they were able to crowd source information regarding their particular problem from close friends and trusted peers on social media. In general, the ability of social media

to keep colleagues connected was mentioned as one of the main advantages of using social media.

Reaching out and networking. One of the most tangible benefits of social media, according to the study participants, was the ability to reach out to a wider audience and to network with like-minded peers globally. According to the study participants, social media has removed traditional barriers of networking within and across organisations. It has enabled physicians to locate and develop relationships with people of different backgrounds from around the world. It promotes more inter-sectoral, inter-organisational, and international communication and networking between physicians. Conversations on social media establish an early connection that might later develop further into a stronger relationship in real-time. The participants gave several examples of connecting with people around the world to work on projects, to publish journal papers, or to create joint podcasts/vodcasts.

In addition, the messages and contents shared on social media move virally among a much larger audience on social media. The potential audience on social media, according to the participants, includes both clinical and non-clinical communities such as patients, managers, politicians, and journalists. This wide audience provides more opportunities for networking, learning, and disseminating knowledge.

Sharing knowledge. Knowledge sharing was mentioned as one of the primary reasons for physicians to join social media. The participants stated that knowledge sharing through traditional mechanisms such as publishing in academic journals is difficult and time consuming. However, social media has provided opportunities to disseminate personal and experiential knowledge or commentaries on the literature much easier than ever before. Some of the advantages mentioned by the study participants that made social media a better choice for knowledge sharing are: it is easy to join and use; it has user-friendly interfaces and functionalities; it is multimedia-oriented and supports a variety of media such as text, images, and audio-video components; it is ubiquitous and can be accessed anywhere, anytime; and it allows access to a much larger audience.

Engaging in continued medical education. The majority of study participants mentioned continued medical education as another main reason for joining social media. Most physicians find it difficult to keep up with current medical knowledge

and information after they graduate from university. Traditionally, physicians used journal papers or educational opportunities to stay up-to-date. According to the study participants, the traditional mechanisms are usually delayed and less effective in terms of time management for busy physicians, whereas information and knowledge on social media moves very fast compared to traditional publications. They usually appear on social media before they get published in traditional hardcopy formats.

In addition, the professional information on social media is usually filtered by enthusiastic peers. In other words, the participants usually receive the most relevant information that has been reviewed and recommended by trusted people and sources on social media, provided that they have already established those trusted connections. Furthermore, most of the knowledge shared on traditional media, according to the participants, is scientific knowledge that most practitioners are rarely interested in, whereas social media discussions are mainly focused on experiential and practical knowledge sharing that most practitioners are eager to learn. According to the participants, social media also provides opportunities to obtain much broader knowledge about a field due to interaction with large groups of clinical communities.

The participants believed that social media is still nascent and underutilised in the healthcare domain and currently there is widespread scepticism and mistrust about the usefulness of social media in healthcare education. Despite this, physicians who used social media regularly believed that it provides a phenomenal educational opportunity, and is going to change continuing medical education. However, it must be aided by healthcare organisations; for example, there is a need for clear, proper, and internationally accepted social media policy that not only regulates, but also promotes the usability of social media. The study participants hoped that with generational change, increased access to the Internet and an increased sophistication of social media in terms of enhanced ability to leverage educational content, social media will find its place in medical education in the near future.

Benchmarking. Becoming aware of new and advanced clinical practices, and learning and incorporating these into practice was also mentioned as another main reason to use social media. According to the study participants, multimedia sharing platforms provide enormous opportunities for ordinary clinicians to record newly recognised clinical practice and disseminate it easily on social media channels.

Clinical practice is sometimes conducted differently around the world. Social media provides opportunities to become aware of different ways of performing the same skill and benchmarking the most effective one. Permanent availability of multimedia files on social media and also the possibility to ask questions or provide comments and feedback were mentioned as some of the main advantages of using social media for benchmarking clinical practices.

Branding. Another reason that participants used social media was associated with the opportunities for personal professional branding on social media. Anyone could use social media to share and promote his/her own particular knowledge, experiences, and findings. Many participants expressed the view that everyone can have a voice on social media and establish her/his own "street credibility". This has now motivated many physicians to look at social media as a way to establish and obtain academic or professional affirmation. Many physicians now have a profile shared on social media tools that introduces their work and areas of interests, and this enables them to develop more professional contacts and encounter more collaboration and work opportunities.

In addition to the major reasons already discussed, the participants mentioned several other reasons to use social media. Examples of these include: educating and interacting with patients, reducing email communication, effective use of time, and collective learning. Some of these reasons were discussed as part of the main categories presented above. Some others were mentioned less frequently or were perceived by the participants as useful but less important reasons to use social media.

While the participants saw great value in joining social media, they were also concerned about the lack of understanding and support by their workplace in adopting social media. The study participants stated that there is a serious lack of understanding about social media among healthcare organisations. Most do not support or have even banned social media use by physicians across the entire organisation. According to the study participants, healthcare managers do not understand the value of social media and tend to view it as time wasting or a risky place that may lead to compromising patient privacy.

The participants believed that healthcare organisations are very protective and conservative about social media. Physicians and other clinical staff are not formally allowed to use social media in most healthcare organisations. Those who use social

media mostly use it privately or anonymously, by using a pseudonym for example, without the knowledge of their organisations. They need to utilise their own equipment and Internet access and mainly have to use it outside working hours.

Physicians who participated in the study expressed their dissatisfaction with some of the strict restrictions imposed at their workplace in regard to social media use within or outside of the organisation. They stated that there is always a fear of being fired among physicians for the use of social media that sometimes makes them reluctant to use social media even outside the organisation.

The main reason that healthcare organisations do not promote the use of social media among clinical staff is probably related to the high potential of violating patient privacy on social media, as discussed above. From the participants' perspective, professional conduct to protect patient privacy must be observed on social media, regardless of its openness. They acknowledged that the need to protect patient privacy on social media is critical and indisputable. However, completely blocking the use of most popular online social networking tools in today's society was not perceived as reasonable by the majority of the study participants. In general, physicians who were using social media said that they needed to put a substantial effort into demonstrating the validity and usefulness of social media to their managers.

4.6 TYPES OF KNOWLEDGE SHARED

After obtaining an overall understanding about social media adoption by the study participants, the data was further inspected to determine what kind of information and knowledge physicians usually share on social media. This was indeed one of the main objectives of the study that would help to confirm initially that tacit knowledge sharing occurs among physicians on social media, before exploring how social media actually contributes to this phenomenon. Therefore, the data was reviewed to determine the types of information and knowledge physicians usually share in social media space, and whether there are any instances of tacit knowledge sharing.

To achieve this goal, a continuum of tacit-explicit knowledge, which was developed by the investigator and introduced in the literature review, was employed (see Figure 2.3 in Chapter 2). The continuum has examples of tacit and explicit

knowledge gathered from the literature. It is important to recapitulate that the study adopted tacit knowledge as a continuum, not as a singular category. Therefore, any tacit knowledge ranging from easily articulable tacit knowledge, in other words implicit knowledge such as tips and tricks, new ideas, and expert opinions, to highly inexpressible pure tacit knowledge such as physical skills, gut feeling, and intuitions was considered as tacit knowledge in the study. This theoretical orientation was constantly employed as a guide in every phase of the coding process.

The thematic analysis of the participants' responses to the interview questions indicated that physicians shared various types of both explicit and tacit knowledge on social media (see Figure *4.3*). They shared contents from published literature, journal papers, guidelines, research reviews, and notes from presentations and lectures; links to other sources; re-tweeted interesting posts; personal profiles; and medical news and events. All these could be considered as evidence of explicit knowledge sharing on social media.

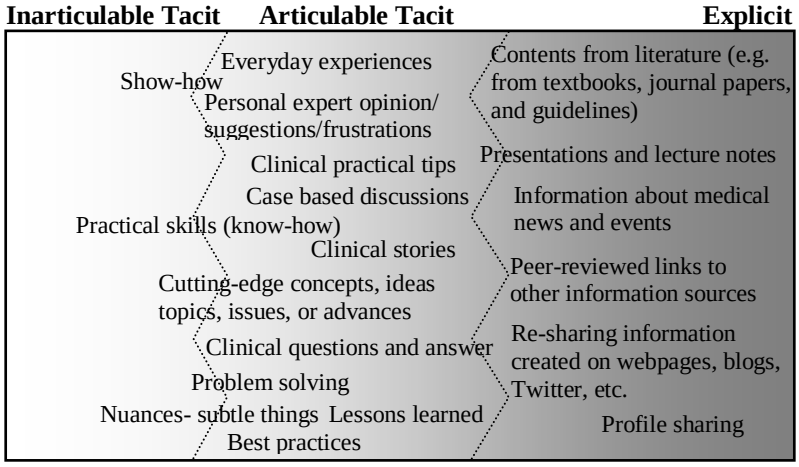

Figure 4.3. Types of knowledge shared among the participants of the study on social media, displayed on the continuum of tacit to explicit knowledge.

In addition to explicit knowledge, physicians also share various types of tacit knowledge on social media. Examples included clinical tips and tricks, personal clinical opinions, day-to-day clinical experiences and lessons learned, demonstrating clinical skills through videos, best practices, case-based discussions, reporting experience from managing unusual cases, asking clinical questions and crowd sourcing for answers, problem solving, and obtaining immediate feedback from peers around the world.

Examples of participants' statements, taken from the interview, indicating the type of tacit knowledge they share will be presented while discussing the potentials of social media for tacit knowledge sharing in the next chapter.

As Figure *4.3* indicates, articulable tacit knowledge sharing (also called implicit knowledge) is more predominant than sharing pure inarticulable tacit knowledge over social media. Articulable tacit knowledge is a type of tacit knowledge with a low to medium degree of tacitness that is not yet codified but can eventually be articulated if an appropriate question is asked from knowledge holders or they want to put an effort into externalising their knowledge (Busch, 2008).

Although articulable tacit knowledge was more common on social media, there was also evidence showing that some inarticulable tacit knowledge might also be shared using multimedia components such as videos and images in which the participants could share technical skills, show-how, models, and concepts that are difficult to verbalise completely. This will be discussed further in next chapter when the themes of the study (particularly the theme of practising) are introduced.

In summary, the evidence showed that physicians share a continuum of knowledge, including various types of both tacit and explicit knowledge, over social media, using various mechanisms and media. The question is now how social media supports and facilitates this process of knowledge sharing, in particular tacit knowledge sharing, among physicians. This is the main question of the study and will be answered in the next chapter.

4.7 CHAPTER SUMMARY

This chapter presented some of the study findings about the population of the study (who they were), an overview of coding (how many codes and categories emerged in each phase of the analysis), patterns of and reasons for social media use by the participants of the study, and finally the types of knowledge they often share on social media. These findings helped to increase our understanding of the phenomenon under study and to lay the foundation for further examining the data with respect to the main research question, contributions of social media for tacit knowledge sharing, which will be presented in the next chapter.

Chapter 5: Social media support for tacit knowledge sharing

5.1 CHAPTER PRERVIEW

The previous chapter presented parts of the study findings that were related to participants' patterns of social media use as well as the nature of knowledge they often share on social media. More importantly, it was shown that the participants of the study (physicians) share various types of both explicit and tacit knowledge on social media. In this chapter, the data will be examined further to answer directly the main question of the study, "*how social media facilitates tacit knowledge sharing among physicians*". Exploring social media's support for tacit knowledge sharing was the primary aim of the study and the central part of the data analysis, as outlined in the introduction of the thesis.

Using the thematic analysis approach and following the steps presented in the methodology chapter, the data was examined, coded, and reviewed to see whether social media has a role in facilitating tacit knowledge sharing according to the physicians' perspectives and experiences. To facilitate the process of coding and data analysis, qualitative data analysis software (NVivo version 9) was used. The initial analysis yielded nearly seventy potential codes that could be considered as potential contributions of social media to supporting tacit knowledge sharing. The initial codes were then reviewed multiple times and reduced to forty-four codes in the next phase and to twenty-one codes in the final phase. Codes where the researcher was uncertain about their accuracy and relevancy during the reviews were removed, codes with common properties were merged to establish a new code or category, and codes with contradictions were retained for further analysis or eventually discarded from the analysis.

Following the steps outlined for theme identification in the methodology chapter, the remaining twenty-one codes were then grouped together to develop higher order categories or themes according to their content similarity, theoretical links, and also their frequency of occurrence. The themes in the study reflect the patterns of experiences and perspectives of the study participants of the potential

contributions of social media for tacit knowledge sharing. Using a constant comparative technique and conducting meticulous and iterative processes of examining and re-examining the codes and concepts applied to verbatim data, and also in relation to each other, ensured the best fit of data to the identified codes, concepts, and themes. The codes and their associated themes were named according to their content.

The final analysis revealed five primary themes that depict how the participants experienced tacit knowledge sharing in social media, in particular, Twitter, blogs, and multimedia sharing sites such as YouTube and Vimeo. The themes included:

1) Socialising
2) Practising
3) Networking
4) Storytelling
5) Encountering

A detailed description and discussion of each theme is provided in the following sections. Each theme is also supported by selections of statements from the interviews. In addition, each theme is supported by a table showing the codes and concepts associated with it. The tables also show the frequency of codes in the data by indicating coding references (number of statements made by the participants in relation to each code) and coding sources (number of participants who talked about each code). These frequencies, however, do not necessarily imply any degree of significance for the concepts identified. Their purpose is merely to demonstrate the analysis process and also to show that there was sufficient support from the data for the codes identified in the analysis.

5.2 THEME ONE: SOCIALISING

Creating a space for socialising (to talk, discuss, and interact with peers) was one of the most frequently reported contributions of social media in helping physicians to share their tacit knowledge and experiences. The participants who used social media had regularly found it a social place where they could easily interact with their peers in a global setting. They could ask their clinical questions and crowd source a response. They could express their opinion freely about a clinical case

posted by colleagues, and they could engage in a live discussion with peers on social media.

Socialising and dialogue are essential for tacit knowledge sharing (McAdam, et al., 2007; Nonaka & Takeuchi, 1995; D. Song, 2009; Yang & Farn, 2009). The term socialisation has different meanings in different fields of study. In organisational literature, it has been defined as a process through which employees learn the social knowledge and skills necessary to adapt themselves to their new job (Chao, O'Leary-Kelly, Wolf, Klein, & Gardner, 1994; Saks & Ashforth, 1997). Nonaka and Takeuchi (1994; 1995) also adopted this term from theories of organisational culture and used it in the knowledge management (KM) field. They defined socialisation as a process of creating new tacit knowledge by sharing experiences, world views, and mental models through mechanisms such as apprenticeship/mentoring, on the job training, and participating in informal social meetings and discussions. Accordingly, socialising in this study was defined as a process of communicating and exchanging experiences, ideas, and beliefs via informal conversations, dialogue, and discussions about job-related problems and issues on social media space. While this definition has connections with Nonaka and Takeuchi's definition of socialisation, its focus is more on informal dialogue and conversation rather than learning from each other through shared hands-on experience and physical proximity.

Socialising and engaging in informal conversations provide an effective and rich social context for learning from each other and also drives motivations for sharing personal knowledge as well as creating new knowledge. The best form of socialisation is through face-to-face communication where people can use both verbal and non-verbal cues in a more natural way to share their understanding and knowledge.

Presuming socialisation and dialogue are theoretically central to tacit knowledge sharing, the data were scrutinised for evidence that supports the occurrence of tacit knowledge sharing through socialisation among physicians on social media. The process of coding, described in the methodology chapter, revealed that several codes were associated with tacit knowledge sharing through socialisation on social media which then constructed the theme of "socialising".

The important codes associated with the theme of "socialising" included dynamic conversations and discussions, questions and answers, instant

communication, and commenting. A list of these codes is shown in Table 5.1 The table also shows the number of coding sources (CS) and coding references (CR) to each code which indicate how many participants (CS) and how many times (CR) they spoke about each concept coded. However, as stated above, frequency does not necessarily imply any degree of significance for the concepts identified.

Table 5.1

Characteristics of Theme 1 (Socialising)

Theme 1	Codes included in this theme were referred to:	CR*	CS**
Socialising	- Dynamic conversations and discussions	55	18
	- Question and answer	33	13
	- Instant communication	28	13
	- Commenting	21	14
	- Open participation	22	13
	Total	159	23

* Coding references; ** Coding sources
Note: The total number for CS is estimated as the total number of participants stating all codes related to theme.

A detailed discussion of each code associated with the theme of socialising is provided in the following sub-sections.

5.2.1 Dynamic conversations and discussions

As shown in Table 5.1, engaging in dynamic conversations and discussions was found to be one of the most common ways of socialisation on social media, as reported by a majority of the physicians who participated in the study. According to the study participants, conversations on social media light up when a new controversial topic is introduced, a new article is published, a particular rare case is reported, a clinical image is shared, or a new practical tip is presented. Most discussions among physicians on social media appear on blog spaces and also in the Twitter sphere. Some discussions even continue in the offline space where physicians prefer to have a phone call or meet in person for further discussion. Discussions among physicians on social media range from clinically-related discussions to chatting about technological, administrative, and system issues.

The following are examples of participants' statements regarding their engagement in professional discussions on social media.

> *For me I'd say the two big categories that I use are one is the discussion with people online about topics relevant to clinical medicine. It can stem from a number of things. Either a real or fictional case somebody proposes a controversy in medicine or any*

really interesting topic, especially in emergency medicine and critical care (Participant no. 14).

Doctor X is a frequent Twitter user and we had a discussion last week ... about sedation of people who are very intoxicated … we discussed about how we go about doing that. And to some extent it was a bit of a tongue in cheek discussion but it was an experiential learning in that he shared experiences where he's tried various techniques and then a chap from New York chimed in with well I've tried this and this. And another chap I think from UK suggested something else and so over that sort of twelve to twenty-four hours there was a Twitter conversation that took place where we all shared our experience in an area where there isn't really a lot of solid evidence … there's no best practice and it's just people saying what they do and what they've found works for them (Participant no. 18).

As illustrated in the above examples, informal live conversations and discussions occur among physicians on social media. Most of these discussions are about job-specific issues and challenges, particularly about clinical problems they encounter in the workplace where there is normally not much clinical evidence and best practice to solve the problem. People just share their personal professional experiences about "what really works" in challenging situations. These conversations are usually great sources of tacit knowledge.

The nature of discussions on social media in regard to the continuum of tacit-explicit knowledge varies. Not all the discussions that occur on social media among physicians are in a tacit form. There are evidently ongoing conversations happening among physicians on social media and a considerable amount of it certainly pertains to personal or professional experience sharing, as explained by most of the study participants. However, due to the nature of researching tacit knowledge sharing, it is not easy to measure how much of these conversations on social media are truly related to tacit knowledge sharing. Nevertheless, it can be argued that informal discussions and socialisation on social media, as face-to-face discussions, are great sources of tacit knowledge. Although the discussions may have components of both tacit and explicit knowledge, the tacit component seems much stronger.

While the participants perceived social media as a great place for developing professional discussions, it was also found that they encountered several challenges in using social media for socialisation. One of the important challenges that was highlighted by the study participants relates to the lack of active participation of physicians on social media. The study participants stated that there is a fundamental lack of understanding of social media among physicians and healthcare organisations. Many physicians still do not believe in the efficiency of social media

for knowledge sharing. They view it as a time wasting effort whose benefits are not tangible enough.

> *Unfortunately most physicians still believe it's just a marketing tool… most physicians have not chosen to do so. They just don't understand it yet. If they don't understand it then they're not going to do it* (Participant no. 19).

Lack of understanding was mentioned as one of the main reasons that many physicians have not completely adopted social media tools. Those who have adopted social media are also using it predominantly as a lurker. They do not contribute often on social media. However, the participants believed that lurkers also receive value from social media by reading, listening, or watching contents shared on social media, even though they do not contribute much. Currently, there is not a significant culture of participation among physicians on social media. According to the study participants, only a small percentage of physicians eagerly and regularly contribute to the social media conversations.

Despite the lack of adoption, physicians who used social media regularly found that social media provides great opportunities for communicating, developing meaningful discussion, and socialising with peers from around the world, something that they would not normally be able to do that easily.

5.2.2 Question and answer

Another dimension of online socialisation on social media was related to the opportunity for clinical questions and answers. Physicians who participated in the study said that they occasionally referred to their peers on social media (for example on Twitter) to ask a clinical question and crowd source an answer. They were usually asking questions on social media when they, for example, faced a bizarre problem at their clinical work or when they were just seeking to obtain re-assurance from their colleagues in regard to their own clinical practice.

Asking clinical questions and seeking help directly was not quite as common among senior physicians; however, junior physicians were found to refer to trusted senior doctors for their clinical questions. Indeed, junior physicians as well as physicians who were working in remote areas found social media to provide a great opportunity to connect with senior physicians around the world and ask them for help. For example, physicians from Europe and Australia who participated in the study talked about how social media helped them when they were on a night shift

with no access to their local experts and they approached Twitter to ask questions of their United Sates colleagues who were awake at that time.

This question and answer type of knowledge sharing can be regarded as evidence of tacit knowledge sharing when it is about sharing knowledge that relates to problem solving or about technical know-how. Physicians who participated in the study stated that they shared numerous practical tips or know-how on social media when peers asked them to help. In addition, they stated that most of the questions on social media relate to job-specific problems. Below are examples of the participants' activity on social media that are related to asking clinical questions and seeking answers.

> *When I have a problem I cannot ask anybody else here. We don't have a senior doctor. I may be the most experienced and I'm just working five years as I said, then I can write to people who I met in my social media network, some emergency physicians from Australia, from US, and I'll write to them and I can get some answers* (Participant no. 10).

> *There is a lot of cases where you put up for a clinical question for example managing the not surrounded chest drain and you'll get the response from four or five different people which range from switch positions to cardio plastic surgeons where they give you a little rule of thumbs which you wouldn't normally find ... in the literature* (Participant no. 1).

As the above examples show, question and answer was one of the most common practices of physicians who used social media. As with knowledge sharing through conversation and discussion, not all questions and answers may carry tacit knowledge. However, a question and answer session is one of the most appropriate ways to develop a discussion and to reveal the tacit knowledge of senior experts (L. Joia & B. Lemos, 2010; Marwick, 2001; Peroune, 2007; E. A. Smith, 2001). The question and answer approach is particularly helpful to disclose types of tacit knowledge that is easily accessible and articulable if an appropriate question is asked.

The level of trust between participants is one of the most important things that influences the process of question and answer and in general, socialisation on social media, according to the participants. Physicians do not simply trust everyone on social media to ask their clinical question and seek an answer. It was found that physicians establish trust differently on social media. The majority of the study participants viewed offline personal interactions as one of the primary ways of trusting people on social media. Almost everyone begins to develop a network of

trust on social media by connecting first with people who they already knew or met in person.

For example, they network with their current or past colleagues from work, or people who met them in meetings and conferences. The level of trust in these situations usually has already been established in an offline environment where people can take advantage of face-to-face interaction to build up mutual trust. Social media then helps these already established offline relationships to persist for a longer time in an online space. Indeed, a lot of people's online interactions translate their authentic relationships in real life. This type of trust-building was rated by participants as resulting in the highest level of trust on social media.

The following two interview extracts illustrate how physicians trust other physicians on social media based on their previous personal interactions.

> *There's people who I know who I've met and I've spoken to in real time, and ... I know who they are and so … I feel like I do trust those people* (Participant no. 18).

> *I have personal interactions with many of them from either national meetings or some other experience and I know them and that's how I trust them* (Participant no. 17).

Authenticity and relevancy of voice is also regarded by the majority of the participants as another important way of appraising peers' trustworthiness while socialising on social media. Evaluating the authenticity and relevancy of voice is particularly important in interacting with new people on social media. The participants explained that they usually observe the sharers' online presence and examine what they share on social media over time. They might ask questions such as: Is the content shared relevant? Is it evidence-based? Does it make sense based on their prior knowledge and experiences? How has the sharer framed the discussions? How do they approach their online presence? Who is behind the content shared? What do other people think about them? These questions help the receivers of knowledge to determine whether a person or the content is trustworthy. If the answers to these questions are not affirmative, the sharer will not be followed any more or might be even blocked.

The following two interview extracts show how authenticity and relevancy of voice are important for physicians when they want to trust their peers on social media.

Obviously by observing what they do and share stuff over time and seeing how they interact with other people and also doing a bit of research or learning about this stuff that they have actually written about and seeing if it measures with your own (Participant no. 15).

The first way that I'll oftentimes that I do ... is does what they say make sense and fit what I believe to be important or I believe to be true … if it looks like that voice is not going to be valuable or helpful or meaningful to me then I just won't bother any further (Participant no. 22).

The participants often referred to their online colleagues as people who seemed to be sharing their knowledge for the right reasons; were happy to share it for free; had no obvious sponsorship; were interested in learning and educating; and were people who cared about their patients. Therefore, they generally seemed to begin their online relationships with goodwill and to some extent, they could be trusted. However, time is an important factor in developing mutual relationships on social media, as stated by a large number of participants. Although it is easy to join a conversation, it takes much longer for beginners to be accepted completely in a trusted community. Furthermore, having similar interests, language and understanding is also important in continuing the relationship.

5.2.3 Instant communication

Instant communication with peers in order to obtain or provide immediate feedback was also revealed as another aspect of online socialisation on social media. The ubiquitousness and high accessibility of social media sites provides an opportunity for users to be available anywhere, anytime, have a knowledge stream on the go, share their knowledge immediately, and stay always connected with peers easily. Participants stated that social media, largely Twitter, enabled them to have instant access to their peers around the world in order to obtain immediate feedback whenever possible.

According to the participants, physicians are incredibly busy people and finding more than two or three of them in a room to have a meaningful discussion about something is not easy and takes a long time to arrange. However, on social media (particularly Twitter) there are always some physicians who are online from different time zones around the world. Their availability is independent of time and place, thus they are available 24/7 on the Internet, and that is how people are usually able to connect at their own favourite time. Social media supports both synchronous and asynchronous learning. For example, Twitter significantly supports synchronous

communication whereas blogs and multimedia sharing sites such as YouTube and Vimeo support mostly asynchronous learning.

In addition, participants believed that social media tools such as blogs and Twitter are like a notebook for individuals, being able to write down immediately what they think about a situation, a research article, or a discussion on social media and share it immediately with their peers in a further discussion.

The possibility of using social media tools on mobile phones and tablets also increases the instantaneous nature of communication on social media. The study participants mentioned many examples of communicating with peers, checking their Twitter or blog feeds, or listening to podcasts while using public transport, standing in a grocery line, while riding a bike, in the gym, on an aircraft, during break times in the hospital, or even in an ambulance. The availably of social media and also the Internet on mobile devices seems very important for the current generation of physicians such that a participant stated that, "*I would say well my iPhone is far more important than my stethoscope really. So I have it on me always*" (Participant number 23).

The spontaneous and synchronous nature of communication on social media (predominantly on Twitter) allows conversations to occur in a more natural and social way. It facilitates dialogue and conversations to happen on a regular basis, fosters a sense of belonging to a community, and lays the foundation for mutual relationships and networking, which are essential for ongoing tacit knowledge sharing.

The following are examples of participants' viewpoints about the instantaneous nature of social media:

> *I think it's a very simple yet can be quite a powerful way to try to get some instant opinions about a problem and with Twitter. I mean I've certainly seen it done on Twitter a number of times where someone has posted something and looking for some quick advice and usually within a short timeframe there's several responses* (Participant no. 6).

> *A physician on Twitter posted about a patient who was in a hypertensive urgency and that they had tried a couple of different medications to bring that under control and that they had not been successful as of the time they posted. So two or three of us who were on Twitter made some recommendations and what we might do in that setting ... it was a pretty interesting example of a very spontaneous self organising thing. Somebody saw something, someone else responded, those comments brought in more*

people and we were able to generate some suggestions and recommendations (Participant no. 22).

As illustrated in these examples, Twitter provides opportunities for synchronous and instant communication where participants can easily reach their peers, send a message, and chat with them about a specific problem they have faced in their job or to chat about a topic that they are interested in. The potential for a large audience and the ubiquitous nature of Twitter also increase the chance of synchronous communication. This can be seen in the second example, as there is always someone somewhere online on Twitter, interested to be involved in the discussions.

In spite of the possibility of instant communication on social media channels (for example, Twitter), the physicians who participated in the study found it hard to be spontaneous all the time on social media due to work demands and other commitments. This was mostly raised by emergency physicians who stated that the nature of their job requires more on the spot action, and this limits their ability to access and take advantage of this kind of online communication.

Finding sufficient time to use social media was mentioned by the majority of the participants as one of the major barriers to engaging effectively in social media discussions. According to the study participants, physicians have a busy profession and barely have enough time to spend on social media. Most work multiple shifts. They have many other priorities and pressing needs in their professional and social life which make it difficult for them to allocate sufficient time for social media. Indeed, many physicians who contribute on social media are mainly doing it at the expense of their other commitments, such as spending time with their family and friends. In addition, it is likely that very few physicians are paid for contributing on or using social media for educational purposes. It is mostly altruistic work, according to the participants.

This inability to dedicate sufficient time probably minimises the opportunity for regular communication on social media that is necessary for developing a mutually trusting relationship, as stated by the majority of the participants. Lurkers and random contributors probably would not be able to socialise and connect with people as effectively as those who are regular users of social media. As one of the study participants stated:

It's got to be a two way street. No one wants to really have in their networks people who are purely listeners. They want to have people who interact in an appropriate way (Participants number 11).

As this example shows, consistent involvement in online interactions on social media plays an important role in remaining within a trusted network. The participants used the term "friends" for some of their online peers because of mutual ongoing communication between them on social media, even though they have never met each other face-to-face. It seems that consistent communication makes it easier for participants to know and understand each other better, and this is necessary for developing mutual trust.

In addition to the issue of finding sufficient time for regular communication, the participants believed that although the immediacy of social media had enabled them to locate and communicate with their peers on social media easily, it is still not quite comparable with the immediacy of face-to-face communication where people have physical proximity, eye contact, intimacy, and a common understanding.

5.2.4 Commenting

Individual commentary on recent topics and issues posted on weblogs, Twitter, or shared podcasts/vodcasts was mentioned as another aspect of socialisation on social media. According to the study participants, social media enables physicians to read short blog posts, listen to podcasts, or watch videos in their spare time and write their comments and opinions about them freely. Commenting encourages rich discussion and enables a much more interactive relationship between authors and readers. Participants found that comments are sometimes even more important than the posts shared on blogs or multimedia channels.

Commenting on social media is mainly asynchronous communication where people read a blog post, listen to a podcast, or watch a video on social media platforms and then reflect upon them based on their personal knowledge and experience through commenting. Reflection on explicit material with individuals' own experience and knowledge is one of the most effective ways to externalise and share tacit knowledge (Haldin-Herrgard, 2000; L. Joia & B. Lemos, 2010; Stover, 2004). Therefore, it can be argued that the possibility to comment on social media may facilitate externalisation of tacit knowledge by providing opportunities for reflecting on the contents presented.

Commenting on social media content was also regarded as a basis for initiating a larger discussion among participants that might lead to further crystallisation of tacit knowledge and experiences shared by peers on social media. Subscribing to comments, using trackbacks, pingbacks, and blogrolls are great features of blogs that enable participants to establish a much larger and distributed discussion about a single topic across multiple blogs. Participants appreciated the commenting feature on social media much more than having a cited journal paper with little facility for commenting and providing feedback.

Examples of participants' statements that acknowledge the merit of being able to comment on social media are provided below:

> *I guess I'm a fairly frequent commentator on some of the other emergency medicine and critical care blogs that are on line* (Participant no. 14).

> *I have developed a rather extensive network … from putting my blog out, reading what they've done, corresponding with them, and commenting on their posts* (Participant no. 16).

5.2.5 Open participation

Tacit knowledge requires a climate of freedom and openness to be shared (Brink, 2003). People are likely to be motivated to share their tacit knowledge in environments that foster openness and freedom and allow people to open up and express their ideas freely. It was found that social media, according to the study participants, provides such an open space for every individual physician to have a voice, exchange personal opinions and experiences, and communicate freely with colleagues with minimum barriers.

The study participants stated that providing an equal opportunity for everyone to have a voice as one of the significant potentials of social media that facilitates knowledge socialisation. There are no obvious walls and restrictions on social media. It is open for everybody to join and participate in the discussions regardless of age, sex, race, organisational position, and so forth. The participants believed that every individual on social media can bring something new and unique to the discussions. For example, senior physicians interviewed in the study talked about how social media helped them to find their individual voice.

> *I love the global conversation. It's allowed me to have a voice that I didn't even have. It's allowed me to develop a voice that I didn't even know I had … I've found my individual voice and it's really enjoyable* (Participant no. 11).

Senior physicians possess substantial tacit knowledge that has been acquired over many years. They need an easy to use and interactive media to disseminate their valuable knowledge quickly to the community. Social media tools such as blogs and Twitter provide them with the opportunity to easily and rapidly share their knowledge with the clinical and non-clinical community such as patients, healthcare managers, and journalists.

Similarly, junior physicians interviewed in the study also stated that they enjoyed the openness of social media as it allowed them to have their say and socialise with senior physicians. They acknowledged that their valuable opinions are well-respected on social media without any pre-judgement about their hierarchical position in medicine or in their organisation. In fact, some of the junior participants felt humbled at first to share their knowledge and believed that they may not be welcomed as they were only junior physicians. However, they were pleasantly surprised when their opinions were received well and respected after sharing their particular tips or thoughts on social media.

The assumption that your idea or thought might be felt to be at too low a level and not interesting enough for others was mentioned as one of the main barriers to sharing experiential knowledge, according to the study participants. However, social media is open for everybody and every question is worthy of being asked, even though it might be very basic and simple as it might be useful for other physicians at the same level. There are also many senior physicians who are online on social media who are interested in teaching and eager to answer the questions of junior physicians.

Participant number 12, one of the junior physicians interviewed in the study, explained the points discussed above well:

> *The ability to be part of that conversation [on social media], have your voice listened to and instead of people dismissing you because you are just a junior person … you're not judged based on what your position is in the world, you're judged based on the value of what you have to say and I think that … is a really sort of democratic and valuable direction that I think social media will go* (Participant number 12).

As this example shows, social media is a great leveller, allowing physicians of different professional backgrounds and levels to interact with each other. The authenticity of people's voices on social media is more important than their age, location, and their position in organisations.

In addition, social media allows patients, particularly patients with challenging diseases, to interact with physicians and share their unique experiences of their illness and their opinions about different treatment options. A group of participants mentioned that they were following the blogs of some patients, who were writing about their experiences with illness, to learn more about those particular diseases. They viewed the patients' participation as another important advantage of social media, enabling a more open participation.

In conclusion, it can be argued that social media promotes a more open participation and conversation allowing individual physicians to have their own voice regardless of their position in the system. It provides an open environment where physicians as well as other clinical professionals and also other enthusiasts (for example, patients, journalists, and researchers) in clinical discussions are able to openly and easily socialise with each other and share their critical knowledge together.

5.2.6 Theme summary

Socialisation is the basis for conversions of both tacit-to-tacit and tacit-to-explicit knowledge. The theme of "socialising" argues that social media has a high potential for facilitating socialisation among physicians which is necessary for tacit knowledge sharing. Socialisation on social media can be established through dynamic conversations and discussions, opportunities for questions and answers, commenting, instant communication, and finally through open participation of physicians with different levels of knowledge and expertise.

Twitter and blogs were found to be the two main tools used by the participants for socialisation. While Twitter supports dynamic and synchronous communication, it seems ephemeral, whereas blogs facilitate the development of asynchronous but strong discussion and socialisation among physicians. The combination of synchronous and asynchronous communication, as well as the existence of a large audience and open participation on social media, provide better opportunities for online socialisation among physicians. The socialisation on social media then facilitates sharing of tacit knowledge, particularly knowledge with a low to medium degree of tacitness. It is important to note that as with face-to-face tacit knowledge sharing, the level of tacit knowledge, which is being shared among physicians during

socialisation on social media, is not measurable due to the complex nature of tacit knowledge.

Despite the potential of social media for online socialisation, social media is still unable to support the non-verbal and social cues that are also critical for tacit knowledge sharing, particularly for knowledge with a high degree of tacitness. Socialisation on social media occurs mainly in a text format. Social media lacks the ability to provide opportunities for online video conferencing or has the same quality as face-to-face interaction. The majority of participants acknowledged that social media is less likely to be able to transfer facial expressions, eye contact, body gestures, or any other subtle cues that are involved in tacit knowledge sharing. Furthermore, tacit knowledge is mostly context-dependent. Discussions on social media may be taken out of context (place or time), and eventually lose their relevancy and impact. Therefore, social media cannot replace face-to-face socialisation. However, it was viewed as a good step forward for IT to assist tacit knowledge sharing.

5.3 THEME TWO: PRACTISING

Watching and observing other people's practices is regarded as a conventional and effective way to transfer tacit knowledge, particularly to transfer technical know-how and skills. Creating such a space to watch, observe, demonstrate, and imitate best practices through social media was one of the main themes that emerged from the data. Some physicians have taken advantage of social media to create and share audio-video presentations of their own particular practice. Video presentations of practices such as shoulder replacement, placing a bougie, or performing some surgical procedures are well known among doctors on social media and these have generated mass discussions, comments, and success stories of practitioners using those methods.

The theme of "practising" was derived as a result of aggregating codes associated with practical skill demonstration and sharing on social media. It includes three main sub-categories: practice demonstration (show-how), learning practical skills through using multimedia components, and benchmarking or adopting practice. The theme of "practising" was deemed important since demonstrating practical skills is one of the principal ways of sharing tacit knowledge in face-to-face learning, as

discussed in the literature review. This theme argues that social media may have the ability to facilitate sharing of practical skills by supporting user-created multimedia components.

Table 5.2 shows a summary of codes and concepts associated with the theme of "practising". Coding references (CR) and coding sources (CR) provided in Table 5.2, as described under the previous theme as well, do not necessarily imply any degree of significance for the concepts identified. The purpose is merely to demonstrate the sufficiency of data support for the concepts identified.

Table 5.2

Characteristics of Theme 2 (Practising)

Theme 2	Codes included in this theme were referred to:	CR*	CS**
Practising	- Practice demonstration	22	11
	- Learning practical skills	23	15
	- Benchmarking best practice	13	12
	Total	58	18

* Coding references; ** Coding sources

A detailed discussion of each code associated with the theme of "practising" is provided in the following sub-sections.

5.3.1 Practice demonstration

The practice demonstration is one of the most effective ways to transfer tacit know-how and practical skills. It can be delivered though two main methods: direct face-to-face demonstration and observation of a skill or demonstration of a skill using visual aids such as videos, simulator games, and pictures. Without demonstration and observation, either face-to-face or through visual aids, medical textbooks, lectures and seminars are not helpful enough in transferring and thus learning the subtleties of practical skills, according to the study participants.

The mantra of "see one, do one, teach one" has been a popular approach in training clinical skills for a long time. It involves physically watching something and then becoming physically hands-on and doing it and finally, teaching it to someone else. The physicians who participated in the study believed that this direct face-to-face demonstration and observation, followed by supervised "hands-on" experience, is still the best way to share and learn practical skills. However, the face-to-face demonstration is not always available due to the fact that senior physicians in

hospitals, or most importantly, the required clinical cases for teaching, are not always available. In addition, face-to-face communication and skill demonstration is not usually recorded and hence, it is not recoverable for future reference. It usually only happens once and may not happen again for a long time. Therefore, the study participants considered sharing online videos of clinical practical skills on an appropriate social platform as necessary for the ongoing education of medical practitioners.

Physicians who participated in the study believed that next to face-to-face demonstration, using videos are a useful substitute to share practical clinical procedures. The audio-visual components of videos help to describe clinical procedures much more effectively than simple words in textbooks. They seem almost live and provide a multi-sensory learning experience. Participants acknowledged that they obtain "*more tacit learning from podcasts and YouTube than ... simply writing blogs*" (Participant no. 1).

The ability of audio-video materials to facilitate tacit knowledge sharing was already known prior to social media (Eraut, 2000; Mavromoustakos & Papanikolaou, 2010; Nilmanat, 2011; Raisanen & Oinas-Kukkonen, 2008; Sarkiunaite & Kriksciuniene, 2005; Y. Wang, 2010). Although audio-video materials (offline or online) existed a long time before social media, sharing these audio-video materials in traditional formats was perceived by the study participants as cumbersome due to the many technical and non-technical challenges. However, social media and new mobile technologies removed most of these barriers and eased the process of sharing multimedia content. Social media channels such as YouTube and Vimeo have provided simple but powerful platforms with fewer barriers and allow for an easier dissemination of user-generated multimedia content.

Today, clinicians and healthcare organisations have begun to share a variety of educational videos on social media that are mainly about how to perform certain clinical skills. Indeed, the participants believed that providing better opportunities to demonstrate and teach practical clinical skills (show-how) and to disseminate them easily is one of the main benefits of social media for physicians. Furthermore, the multimedia aspect of social media was perceived as powerful in terms of encouraging and enabling physicians to visually demonstrate certain clinical procedural skills and share them on social media.

The study participants provided several examples of when they had videotaped their own particular practical skills and shared them with the clinical community on social media. Some examples of these videos were about demonstrating skills needed to accomplish an ultrasound on an aircraft, performing a cervical surgery on a rarely seen case, and shoulder replacement techniques.

The following two interview extracts illustrate the point discussed above. The interviews reflect the physicians' activities and opinions in regard to demonstrating clinical practice on social media.

> *We have actually got a published YouTube channel that we put … video demonstrations of actual procedures done during clinical work … it's quite powerful in terms of being able to share people's clinical experience in that it can just add that visual element where seeing something will much better describe the thing rather than trying to describe it in a thousand words* (Participant no. 6).

> *It's very easy to demonstrate things that are difficult to show in print. You know to actually technical procedures, to be able to show it in real time on videos* (Participant no. 14).

In summary, creating educational videos of rare clinical cases or procedures, with patient consent and ethical clearance, and sharing them on social media channels such as YouTube, Vimeo, and HQMedED was mentioned as one of the best methods to transfer knowledge and expertise to medical students as well as junior physicians. These videos were perceived as great substitutes when there is no adequate number of particular patients that physicians or medical students may be able to visit personally, or observe when the examination process is carried out by their supervisors.

Despite the advantages of social media channels for sharing a demonstration of practical skills, the richness of media used for tacit knowledge sharing is still an issue, particularly in the case of sharing knowledge with a high degree of tacitness. Although social media has enabled the sharing of user-created audio-video files that have the potential to demonstrate hands-on experience, which is also supported by the ability to comment, provide feedback, and develop discussions, it is still far from face-to-face communication which is much richer than IT-mediated communications. As mentioned above, losing social cues such as body language, emotional feelings, and eye contact is argued to be a major shortcoming of most computer-aided communications (Hislop, 2001; Hooff & Weenen, 2004).

5.3.2 Learning and benchmarking best practices

Learning clinical practical skills and benchmarking best practice were mentioned as some of the main reasons for using social media by physicians participating in the study. The participants believed that educational videos shared on social media are great sources for learning practical skills. They provided several examples of watching a video or listening to podcasts shared on social media, learning new skills, and incorporating them into their own practice.

Benchmarking is a learning process, which involves systematically identifying, evaluating, adapting, and implementing best practice from internal or external sources in pursuit of performance improvement (van Lent, de Beer, & van Harten, 2010).

According to study participants, social media enables physicians to search for and adopt the best practices available, although they may not necessarily be best practices. They asserted that videos shared on social media channels such as YouTube, Vimeo, and HQMedED or their links on blogs enabled them to learn different ways of performing a given procedure and adopting the best ones to their practice. In addition, participants stated that watching videos on social media helps them to perform procedural skills in their job with more confidence. As one of the study participants said: "*I think I got a lot more comfortable using LMA [Laryngeal Mask Airway] as a bridge to intubation because of all the online discussions*" (Participant no. 13).

The following interview extracts are examples of practice benchmarking described by two of study participants.

> *Today for example I was on YouTube and I was looking at a video of how to put in a particular type of chest tube and watching somebody do it and I learned several things by listening to their commentary and watching their techniques. I watched it a couple of times, learned something new each time. And that happens with regularity* (Participant no. 21).

> *As far as I'm aware, three cases that we have had fed back to us that ... as a result of what they saw us teach, what they heard us teach about and they looked at the resources that we posted, that they'd actually performed emergency surgical airways on actual patients in emergencies and they were all successful … So three people's lives at the moment are owed to the fact that some doctor somewhere, watched that blog site, watched the videos we recorded ...* (Participant no. 6).

As the above examples show, social media has a high potential to expose physicians, particularly remotely located physicians, to current best practices and

enable them to deliver high quality services. According to the participants, if physicians do not see a particular case for several months or years, their experience will probably be lost over that time. This is where online videos can play an essential role in refreshing physicians' memory to perform a procedure more confidently and accurately. In addition, educational videos on social media sites such as YouTube and Vimeo, and also on blogs are particularly useful for physicians who are located in remote areas with no supervision and limited learning opportunities. For example, a participant stated that:

> *Because I work in a very remote part of Australia … for the first eight years of my practice out here I was just doing what I was taught in the big hospitals and probably didn't really learn too many new skills over that time ... But I think the exposure to such a broad diverse range of experience from all over the world really hones your practice and keeps you up-to-date with what is current best practice* (Participant no. 18).

Participants mentioned several advantages for videos shared on social media, compared to other formats of videos such as traditional video tapes, CD-ROM, and other formats of online videos; as well as compared to face-to-face demonstrations of a practice.

The first advantage of sharing videos on social media, according to the study participants, is about the long time availability of the videos on the Internet. As long as there is an Internet connection, videos shared on social media channels such as YouTube, Vimeo, and HQMedED are obviously available anytime, anywhere, and by anyone. They can be watched at the user's convenience, for example, after working hours, in break times, or in any spare moments. They can be watched multiple times for a complete understanding and to learn the demonstrated skill. In contrast, face-to-face interaction, for example, is a one-off experience. A particular procedure, demonstration of a skill, or the examination process of a clinical case might be seen once and might not be able to be seen again for several years. However, if the experience is recorded and shared on social media, it will be available almost forever on the Internet.

The possibility of developing ongoing discussions, commenting, providing feedback, tagging using personal keywords, rating, and searching were all mentioned as other advantages of videos shared on social media channels. Traditional videos (offline or online) lack many of these possibilities. Participants stated that reading comments and the possibility of asking questions about ambiguous parts of videos

and the ability to be involved in the discussion are all aspects that amplify the learning experience and the understanding of the contents of videos shared on social media.

Participants acknowledged that the immediate feedback provided in face-to-face interaction is more effective than the discussions on social media. However, face-to-face communication, as discussed in the previous section, is not always available or possible due to limited resources, staff, and time.

Faster dissemination of information to a wider audience is also reported as another difference between videos shared on social media channels and traditional videos or face-to-face demonstrations of skills. According to the study participants, it takes a long time for physicians to be given grants for training or re-training through the traditional channels in the healthcare system. However, exposure to up-to-date clinical best practice and ongoing discussion with colleagues on social media might be a useful self-training alternative for physicians.

The following interview extract illustrates the points discussed above. It is a good example of the participants' views about the difference between face-to-face learning and learning through social media interactions.

> *Obviously face-to-face learning is always going to be a better learning experience than sitting in front of the computer but those episodes are few and far between and also they are a one off. So if the person does a chest drain for instance and then never does another one for a year, that experience is basically wasted. Whereas if they can then go away afterwards and immediately look at a high quality video for instance which there are free ones available of watching an expert how they put in a chest drain and talk about the pros and cons of it … that leads to active learning … then you can leave comments and discuss it. I mean the capacity for sharing experiential knowledge through that way is just far greater* (Participant number 15).

Despite the perceived advantages of online videos on social media, the study participants did not recommend referring to online videos without first acquiring introductory or basic medical knowledge about the topics shared. For example a participant stated:

> *You can look up a procedure and essentially learn how to teach yourself how to do it. As long as you know some basic stuff you can teach yourself how to do it from YouTube* (Participant no. 12).

In addition, referring directly to the YouTube channel where clinical videos are mixed up with other entertainment or non-professional material makes it difficult to find the relevant material and this was also not recommended by study participants.

Instead, they advised using the links shared on professional blogs, Twitter, or other medical multimedia channels which guide people to the videos shared on YouTube.

In addition to the videos and their essential role in benchmarking clinical practice, listening to the podcasts, looking at clinical images, and participating in the discussions on social media were also mentioned as helpful in learning and incorporating clinical practices. For example, the participants spoke about how they learned several new tips from medical blogs that had a dedicated page for clinical practical tips and which were mainly in a written format and were supported by pictures or podcasts.

Sharing clinical images is also popular among physicians who use social media, according to the study participants. Physicians usually share clinical images with their colleagues on social media when they encounter an unusual CT scan, abnormal findings in ultrasound, X-ray and ECG images, or any images that they think might serve as a learning point for the benefit of others. According to Nilmanat (2011), sharing images in online discussion forums may facilitate tacit knowledge sharing. Therefore, it can be argued that social media also may increase the chances of sharing tacit knowledge among physicians by enabling them to easily share clinical images.

5.3.3 Theme summary

As was shown in the literature review, a practice demonstration followed by an interactive observation and imitation is regarded as one of the most effective ways to transfer tacit knowledge. The study found that the multimedia aspect of social media has great potential to facilitate tacit knowledge sharing among physicians and other clinical practitioners by enabling them to easily share clinical skills using multimedia components.

The theme of “practising” postulates that social media channels such as YouTube, Vimeo, and HQMedED have the great ability to quickly and almost effortlessly disseminate audio-video materials, which are generated by physicians themselves, in order to demonstrate a particular practical skill. In addition, the theme argues that social media provides opportunities for the clinical community to watch, imitate, learn, and benchmark practical skills shared on social media channels. Furthermore, the possibility of developing ongoing discussions, commenting,

accessibility, and searching functions on social media all seem promising for physicians to use this technology to create and share audio-video presentations of practice demonstrations.

It was also demonstrated that despite the advantages, social media has limitations in facilitating practice demonstration and learning. In particular, compared to traditional multimedia technology, although social media provides better facilities for practising (such as opportunities for commenting on and developing discussions about shared multimedia files), it still lacks the richness required for transferring highly tacit skills in which people prefer physical proximity and using multiple senses to learn. However, based on the evidence presented in this study, it can be argued that videos shared on social media channels not only can easily facilitate sharing of articulable tacit knowledge but can also partially facilitate sharing of inarticulable tacit knowledge.

5.4 THEME THREE: NETWORKING

Developing mutual relationships and networking have been regarded as the basis for tacit knowledge sharing. Networking might be the first step to initiate and establish opportunities for tacit knowledge sharing. On the other hand, social media is also well known for connecting people in a global setting and its potential for opening up networks for like-minded people has been adequately addressed in the literature. This potential of networking on social media was also acknowledged by all twenty-four participants of the study who proposed that the main power of social media, with regard to the clinical community, is in building networks of clinicians with common interests from different places around the world.

The theme of "networking" was originated by a combination of several codes and concepts that were associated with developing relationships and networking on social media. According to the study participants, social media enabled them to locate experts and pioneers in the field beyond their immediate access in their local departments. It also enables physicians to establish relationships and collaboration with people from different disciplines.

Table 5.3 shows a summary of codes and concepts that were found to be strongly associated with the theme of "space for networking with colleagues". Each code is supported with both its coding references (CR) and coding sources (CS).

Table 5.3

Characteristics of Theme 3 (Networking)

Theme 3	Codes included in this theme were referred to:	CR*	CS**
Networking	- Expert locating	41	18
	- Inter-organisational networking	18	11
	- Cross-disciplinary interaction	21	14
	- Professional collaboration	18	11
	Total	98	24

* Coding references; ** Coding sources

Further explanations of each aspect of the theme "space for networking with colleagues" are given below.

According to the study participants, being able to network and get to know and talk to each other is probably one of the main tangible benefits of social media. Almost all participants admitted that through social media they had developed relationships with like-minded peers that they would probably not have been able to establish using traditional means of communication such as in-person meetings, phone or email communications, or attending a professional conference. They believed that these traditional communications are still valid and the predominant way of developing mutual relationships. However, the amount of interaction, feedback, and networking resulting, for example, from writing a blog post was far greater than could have resulted from spending thousands of dollars travelling overseas to present a paper and exchanging business cards, which may or may not have resulted in a useful link with peers.

Networking on social media simply begins with a brief conversation on Twitter, or by reading, watching, listening, and commenting on what other clinicians have posted on their blogs or YouTube channels. The relationship develops further to an email or phone call to produce collaborative material and even to visit each other in person, all resulting from contact in a virtual space. Networking over social media has several aspects and advantages that will be illuminated further in the following sections.

5.4.1 Expert locating

The first benefit of using social media is to locate eminent experts in the field who are willing to help. Social media tools such as Twitter, blogs, LinkedIn, and Google+ enable physicians to share their professional profiles online in a format that

is not static but dynamic. This dynamic nature of social media allows peers to assess shared profiles over time in terms of authenticity and truthfulness via frequent communication with profile owners. In addition, social media allows physicians to extend their existing network by enabling them to link with new like-minded peers through friends-of-friends relationships, friends' suggestions, and establishing relationships with people who have joined or come together in online professional groups. Therefore, social media has a strong potential to locate and follow those who are leading in the field, and hence to initiate dialogue or collaboration with them. As one of the participants mentioned:

> *As you begin to engage in conversation you become aware of those people who are able to help you professionally in the social media setting, you become aware of those people who are producing good quality peer-reviewed information* (Participant no. 1).

Having access to experts is especially critical for junior physicians as well as those who work in remote areas. According to the participants, physicians in remote locations are several years behind the current healthcare mainstream because of limited formal learning opportunities, as well as limited access and interaction with senior experts. Social media enables such physicians to easily find and communicate with senior physicians and specialists who are eager to help others. As an example, a perspective of a remotely located physician who participated in the study is provided below.

> *I believe I have access to a greater pool of expertise than I would if ... I'm much less likely to work in a silo, especially given that I work in what would be considered to be a bit of an outpost in the middle of nowhere. I'm … much more sense that I work in a sort of global community with certain standards … and I think that's got to be a benefit to my patients* (Participant no. 12).

Access to experts in terms of "who knows what" and "who can do what" is important in the tacit knowledge sharing process. Therefore, it can be argued that social media contributes to tacit knowledge sharing by providing opportunities to connect and develop relationship with experts over great geographical distances. However, expert locating is just the initial step to tacit knowledge sharing. For tacit knowledge sharing to occur, depending on the degree of tacitness, a stronger relationship level is necessary. Relationships on social media will not go beyond the simple conversations if regular communication exchange and mutual trust are not established between sharers.

One of the important things that the participants mentioned they pay attention to while expert locating and developing trusted relationship on social media was the professional standing of physicians on social media. According to the participants, the professional standing of people is an indicator of their level of knowledge and trustworthiness. The participants explained that they sometimes perform a background check on the Internet to ensure that people's qualifications such as their education, professional experience, and publications are accurate, and also to see what their peers think about them. Knowing basic information about a sharer is the first step to initiate conversation and develop trust on social media. It is particularly important in the medical context where patients' lives matter most for physicians.

According to the participants, there are now many well-known physicians on social media sites (mainly on Twitter and blogs) and when following them or having conversations with them, it is relatively easy to ensure that the information received is authentic. Although the participants mentioned several times that people on social media are not judged on the basis of their position or reputation, as the following two examples indicate, they actually seem to attach importance to the professional standing of people on social media.

> *If a professor of emergency who has been following for quite some years who is an expert in that, if he says something you can really try it* (Participant no. 10).

> *Then there's obviously their professional standing, where they work, what their clinical position is or if you know what research they've already done* (Participant no. 15).

Simultaneously, the participants offered several examples of how junior physicians were also welcomed to the discussions when they had a valuable idea, knowledge, or experience. Therefore, it can be argued that although professional standing may seem to be an important factor in an early connection, the authenticity and relevancy of voice matter most in fostering a strong relationship in the long term, as discussed already in previous sections.

Some physicians also participate on social media anonymously due to their employers' restrictions on the use of social media or because of the strict rules about maintaining patient privacy. The study participants appreciated the need for anonymity on social media that was sometimes due to personal security and privacy issues. However, it was regarded as one of the major barriers to developing trust and networking with people on social media. As an example, the physicians who

participated in the study were not very interested in participating in wikis pages, due to the anonymity of authors and the lack of mutual interaction and recognition between participants.

Anonymous users may not be able to garner people's trust and respect on social media and hence, they might lose their ability to network with people, as one of the study participants stressed.

> *There has to be a point at where you need to actually be somewhat real behind your avatar so you can engender trust and respect when it comes to conversations* (Participant no. 11).

Peer recommendations were also mentioned by the study participants as another way of locating and linking up with experts in the field and establishing mutual trust on social media. Obviously, people would more likely invite or accept invitations from colleagues of colleagues than accept completely blind invitations on social media. For example, a participant stated that, "*this person was recommended to you by somebody who you trust*" (Participant no. 10), when he was talking about how physicians trust each other on social media. Another participant mentioned that, "*I don't think there is any gold standard to do it [trust]. I think just experience and recommendations*" (Participant no. 14).

As the above examples show, recommendations play an important role in initiating and building trusted relations between individuals on social media, particularly when there are no previous personal relations and interactions between them. This assists in identifying those people who have similar interests and can be included in a network of trust. By initiating communications that are based on peer recommendations, they could later determine whether to maintain or cease the relationship based on their own subsequent personal experiences.

5.4.2 Inter-organisational, inter-disciplinary networking

The other aspect and advantage of networking on social media, as mentioned by a large number of study participants, is that it removes the traditional boundaries between different organisations, departments, and professionals. It provides opportunities to network with people who are beyond local access and it occurs in a global setting. As a result, it facilitates cross-organisational and cross-disciplinary interaction and collaboration by providing opportunities for physicians from different geographical locations and different organisational settings to interact with each

other, to participate in the discussions, and to network on social media space and maybe to extend it to a real-time interaction.

Social media tools such as blogs, Twitter, and some social networks in the medical area bring not only physicians with different specialisations together, but also encourage nurses, patients, social workers, and journalists to join in discussions of common issues. Indeed, the study participants mentioned reaching a wider audience and having a diverse readership as some of the main reasons for joining social media.

A large number of participants viewed this is as a key benefit of joining discussions on social media in which you can obtain a range of opinions and experiences from people with different backgrounds working in different organisational systems and geographical locations. Some participants even mentioned that they visited each other's departments whenever there was a conference overseas or on other occasions as a result of networking on social media.

One of the study participants described the cross-organisational and cross-disciplinary aspects of networking on social media well:

> *Obviously I do interact with far greater range of people by terms of geographical location … and also different professional background … a lot of teaching face-to-face is mono disciplinary, not multi disciplinary. So you generally get one group of professionals and in my case doctors whereas on some of the blogs you can get perspectives of other disciplines* (Participant no. 20).

Another participant added that,

> *Connecting with colleagues both in family medicine and outside of the speciality who have a different perspective on care means that I'm able to gather experience and run into information that I wouldn't have found otherwise* (Participant no. 22).

As demonstrated in the above examples, social media has great potential for enabling physicians to network with people from different specialist areas and backgrounds. This inter-sectoral and inter-professional networking on social media encourages tacit knowledge creation and sharing by opening up clinicians' minds and keeping them up-to-date as a result of seeing other ways of doing things and hearing a diversity of experiences and opinions about healthcare from people within and outside of their specialisation and from across systems, places and time zones. This multi-level, multi-layer interaction helps them obtain much broader knowledge and

understanding about a particular issue or controversy and this may increase the chance of creating new knowledge.

5.4.3 Professional collaboration

Another aspect of networking on social media, according to the study participants, is about providing opportunities for professional collaborations. A considerable number of participants had developed relationships with other colleagues to create knowledge products such as collaborative writing of papers, essays, or blog posts, creating podcasts and vodcasts, sharing projects and grant proposals, receiving invitation for seminar, conference, or workshop presentations, and sometimes offering job opportunities.

Collaboration between physicians on social media does not happen very quickly. Instances of collaboration are still few and far between and only occur when there is regular communication and mutual trust between participants. However, according to the participants, it is much more productive than traditional networking and collaboration due to the potential of being available on social media regardless of time and place and opportunities for instant communication and developing discussions on a global basis.

Most collaborative products created by clinicians on social media, as described above, are more likely to be about explicit knowledge sharing. However, the important thing is that social media brings these people together to talk, discuss, and also share their knowledge. Early connections on social media are much like building foundations for future tacit knowledge sharing. Examples of participants' experiences of collaboration among physicians on social media are provided below.

> *I think just the kind of collaborative relationships that I've built in this short time have been great … I've been interviewed twice for [someone's] podcasts, I've had a couple of different things that have been on Life in the Fast Lane [blog], I'd say probably at least once a week I get in dialogues with some of the other people who are online … there hasn't been a huge bunch of academic productivity out of it but you know building these kind of relationships and conversations going forward has been enormous* (Participant no. 14).

Another participant talks about how social media connections leads to collaborative projects.

> *Already there are a couple of projects that have developed out of these online connections … you're able to make a connection there … and then you can take that off line to an email or a phone call or something like that and then you actually can*

get to know somebody … that then can be turned into different relationships heading forward in terms of sharing a project, writing an article together. There's been talk about putting together grant proposals, all with people that I would have never have met if it hadn't been for this (Participant no. 22).

Collaborative relationships were not only limited to creating knowledge products such as writing journal papers and essays and creating podcast/vodcasts. There were also examples of a group of physicians collaborating with each other to work out a treatment plan for a specific clinical problem. Such patient-specific discussions mostly happen in a secured social network or through private messages on Twitter. The following is an example of collaborative treatment planning by orthopaedic surgeons in an online secured social network.

We had a complex case on a shoulder recently ... it was a fracture as well as a number of soft tissue related injuries. Basically undescribed in previous literature and we went back and forth over a number of days to work out a treatment plan for his surgeon who then went ahead and executed the plan that we had collectively come up with (Participant no. 19).

The interesting thing about networking on social media is that the line between junior and senior physicians almost disappears. Participants mentioned several cases where junior physicians collaborated with senior physicians to produce collaborative material. Junior physicians believed that their voices and most appropriate ideas were usually heard on social media regardless of their position.

5.4.4 Theme summary

Networking, as highlighted in the literature, is a predecessor for developing mutual trust and socialisation and therefore, it is necessary for tacit knowledge sharing. The theme of "networking" argues that social media has enormous potential to build global network(s) of physicians and other clinicians with similar interests that might have not been possible before. It maximises the ability to find new people by expanding both the breadth and the reach of the network that a person can participate in.

Social media facilitates networking among physicians in several ways. It enables physicians to locate eminent experts in the field in different time zones and over great geographical distances. It allows them to track and follow others people's experiences and opinions. It also helps physicians to be up-to-date with current evidence, best practice, technology, and science. It overcomes the traditional boundaries between different organisations, departments, and professionals and

provides opportunities for cross-organisational as well as cross-disciplinary communication and collaboration. Such networking on social media establishes a basis for fostering strong relationships, either online or offline, for mutual learning, and also for tacit knowledge sharing.

5.5 THEME FOUR: STORYTELLING

Another theme that emerged from the data related to creating a space for interactive "storytelling". Humans are inherently narrative beings and enjoy telling and sharing stories (Strahovnik & Mecava, 2009). Storytelling has been regarded as one of the conventional methods for tacit knowledge sharing (Carud, 1997; Linde, 2001; Mládková, 2010; Sole & Wilson, 2002). It has been defined as the process of "sharing knowledge and experience through narrative and anecdotes in order to communicate lessons, complex ideas, concepts, and causal connections" (Sole & Wilson, 2002, p. 6).

The power of storytelling in tacit knowledge sharing is in drawing the listener or the reader to the content in a way that they can experience what the storyteller has already experienced virtually and in a surrogate fashion (Mládková, 2010; Sole & Wilson, 2002). Therefore, listeners/readers can acquire almost the same understanding as the storyteller about the situation without actually experiencing it themselves. It also helps to crystallise and externalise personal tacit knowledge in a more natural way.

Stories do not only transfer factual knowledge. Rich contextual details as well as personal experiences, emotions, and perspectives attached to stories make them ideal for carrying tacit knowledge (Sole & Wilson, 2002; Swap, Leonard, Shields, & Abrams, 2001). Stories are usually supported with examples, metaphors, and models, which enables knowledge to be transferred in an image by image manner rather than a word by word manner and this makes it easily remembered (Strahovnik & Mecava, 2009). Stories can also be in various forms such as oral, written, filmed or illustrated (Carud, 1997).

The ability of social media, particularly blogs, in creating an interactive space for storytelling was acknowledged by the majority of the study participants. According to the participants, social media has significant potential for storytelling, such as providing opportunities for case reporting and developing discussions about

challenging cases, sharing personal experiences and lessons learned, and presenting stories in a multimedia format. The origin of the theme, "storytelling", in the study was based on this potential.

Table 5.4 shows a summary of codes and concepts associated with the theme of "storytelling". Further explanation about each aspect of theme four (storytelling) is provided in the following sub-sections.

Table 5.4

Characteristics of Theme 4 (Storytelling)

Theme 4	Codes included in this theme were referred to:	CR*	CS**
Storytelling	- Case reporting and discussions	37	15
	- Sharing personal experiences & lessons learned	52	19
	- Multimedia oriented storytelling	26	14
	Total	156	21

* Coding references; ** Coding sources

5.5.1 Case reporting and discussion

Storytelling on social media, according to the study participants, begins with sharing a clinical conundrum that happens at times in the workplace. Examples include encountering an unusual case, difficulties in managing a particular condition, and facing a bizarre CT scan or ECG. Reporting clinical cases, particularly unusual cases, and developing discussions about them was one of the most common interests of physicians using social media.

The participants described that they would usually first share the technical details of a case or a problem they encountered in the workplace and then they would update the information as things became more clear. Then, the other colleagues who had read those stories on social media would attempt to give their input on possible causes of the disease, what they thought the diagnosis might be, and what they would do and how they would manage the problem according to their past experiences. Two examples of participants' use of social media for sharing clinical cases are provided below.

> *I sometimes write about patients or my own personal experiences … I run a lung cancer blog. I'm really constantly talking about cases that have come up in interesting conversations … I'm talking about my own patients, experiences of patients who did unusually well or poorly that might be instructive for other people* (Participant no. 5).

I work at a major trauma centre. We see unusual stuff all the time, always new. I occasionally see something new that really is, you're never going to find it in any textbook, any literature anywhere. I measured somebody's … I put that out there too and that generated a large amount of discussion and was very useful (Participant no. 11).

The main social media tool used for storytelling, according to the participants, was blogs, followed by the delivery of announcements on Twitter about the story. However, the participants mentioned cases in which they used podcasts and vodcasts in their storytelling approach where they recorded their discussions about challenging cases and shared them online for everybody to use.

The majority of study participants were actively involved in blogging and had sufficient experiences in that. They expressed the view that blogs provided an opportunity for them to write their everyday clinical stories in an easy and informal manner. Compared with other social media tools, blogs offer more space to write. They are easy to use and it does not need much technical knowledge and skill to run and operate a blog. Blogs support almost all media formats such as text, image, and audio-video contents. They are also persistent, compared to tools like Twitter, which is ephemeral.

Features such as the possibility to make comments and subscribe to updates are also other advantages of blogs that make them more interactive and participatory. Furthermore, other social media tools can also be integrated into blogs. All these features encourage physicians to use blogs as one of their main storytelling and knowledge sharing tools. The primary aim of blogs was also to enable users to publish online personal diaries, which are also a kind of storytelling.

Below is an example of a participant's view about the potential of blogs for storytelling.

I think the blog is a little bit different medium, it has more space, it gives you an opportunity to write really stories … to include other media like photos, audio, videos and so on … to really go into deeper discussions … and also interacting with people via comments and so on (Participant no. 10).

Although case reporting on social media was common amongst the participants, reporting sheer technical details of a case may not necessarily result in tacit knowledge sharing, unless there is interaction between people who listen to/read the story with each other. Indeed, having a dynamic space where physicians can

develop deeper discussions on reported stories by making comments is one of the advantages of writing stories on social media.

It is worth noting that physicians avoid sharing details of patients in an inappropriate way. All participants stated that they only share patients' details in an unidentifiable way (in other words, with no mention of names, time, place, or any other personally identifiable information) to respect the privacy and confidentiality of patients. In fact, the participants cited protecting patient's privacy as one of the main issues that sometimes prevented them from sharing their personal experiences on social media.

According to the study participants, sharing any patient's specific or identifiable information on social media is considered a breach of patient privacy rules (for example, HIPPA[3] rules in the Unites States). The participants believed that the risk of unwittingly disclosing patient information on social media is higher than on any other knowledge sharing tool. The risk of disclosing patients' information is not limited to public social media tools such as Twitter, blogs, and YouTube. Participants mentioned that even in the dedicated online social networks for doctors, which are supposed to be highly secure, there is always a chance of leaking patient information.

Below are two examples of participants' opinions about maintaining patient privacy on social media.

> *I am very nervous about writing anything that might be identified, even if it's only identified by the patient* (Participant no. 9).

> *Obviously the key thing is to make sure that they're [clinical images] not patient identifiable which is obviously the big bugbear in social media* (Participant no. 15).

These examples clearly show how important preserving patient privacy is on social media. Respecting patient privacy is not just limited to avoiding sharing a patient's personal details such as name, date of birth, or photos and videos of the patients, but also includes the time and place of the patient-physician encounter, or any information that is immediately linkable to the patient's particular condition. The fear of not maintaining patient privacy appropriately on social media has created a situation where some participants viewed social media as a risky place to share an

[3] Health Insurance Portability and Accountability Act

individual patient's stories. There is the possibility that the sharer's job or position might be jeopardised if patient privacy is not respected properly on social media. The situation has led to a lot of physicians staying passive on social media. For example, a participant stated that,

> *I don't feel comfortable posting about a patient and giving clinical details about a real person even if I don't identify them. Because I think that there's still some risk and some precedents where you can get yourself into trouble* (Participant no. 22).

The problem becomes even more complicated if the sharer wishes to remove mistakes from social media. It would be very difficult, if not impossible, to completely remove shared information from social media sites considering their open nature and the large audience that uses these tools. Therefore, acting completely professionally on social media is very important from the beginning, as recommended by the study participants.

According to the study participants, the best way to keep patient confidentiality is to regard social media as part of their everyday professional communication and adhere to the same patient privacy principles and codes of conduct that are required in the workplace. All patient-related information must be substantially de-identified or patient consent must be obtained before sharing patient information on social media. Physicians must not reveal any actual patient information on social media as far as possible. Instead, they should share the story in an anonymised fashion and should concentrate primarily on the main purpose of sharing the knowledge and experience. As one of the study participants stated, "*you have to play the ball, not the man*" (Participant number 15).

Most physicians avoid sharing anecdotal stories unless they think there is something that can be learned from them and that they can also support them with evidence and references if any are available. They also share clinical cases when they think such cases are not adequately described in the literature and when there is no reliable evidence or best practice to draw on. They share because either they have a question or they want to crowd source and ask more than one person to think about the unusual case reported.

In addition to respecting patient privacy, there is a need to respect colleagues as well as organisational privacy on social media, according to the study participants.

Physicians using social media must be careful not to harm their colleagues or organisation by sharing information which may influence their position or reputation.

5.5.2 Sharing personal experiences and lessons learned

Providing opportunities to share personal experiences and lessons learned from the management of particular clinical conditions or rare findings was mentioned by the study participants as one of the important aspects of storytelling on social media. In the participants' opinion, medical practitioners are more interested in practical knowledge and experience than the scientific knowledge published in journals and textbooks. According to the participants, relaying the knowledge acquired in critical clinical encounters is more important than re-stating the facts from the relevant literature. This is done best when it is supplemented by real-life stories and experiences from the workplace.

The participants mentioned several examples of sharing their stories of how they had applied a special technique and what the outcomes were, explained learning points, shared mistakes, failures, and successes on social media tools such as blogs, Twitter, YouTube, and podcasts/vodcasts. For example, a participant talked about sharing the lessons he learned from losing a patient under her/his care and how she/he managed a similar situation in the next case a few years later and saved someone's life.

Another example was of a participant who had shared a blog post about "failed surgical airway", which was obviously about a video of someone's story about performing surgical airway unsuccessfully. The primary purpose of sharing these stories was to inform other colleagues to avoid such critical mistakes. Such workplace stories are usually great sources of tacit knowledge.

Age and job experiences were also found to be important factors in sharing personal experiences. Junior physicians were found to be less willing to share their personal knowledge, while senior or retired physicians were more interested and comfortable to disseminate their personal experiences.

The following are two interview extracts that show participants' viewpoints and experiences in sharing their personal experiences on social media.

> *An example would be how I personally manage atrial fibrillation, how I manage this particular cardiac arrhythmia … it's done differently around the world and it's something that I have a particular interest in so I've shared how I have managed*

patients, the experiences that I have had with doing it in particular ways and then I've put that on my podcast (Participant no. 21).

You do get a lot of that sort of personal experience, practical tips, that experiential knowledge … you can get that sharing information that isn't necessarily referenced by twenty journal articles or whatever but it's actually how it happens in reality, it's what people really do based on their experience, based on what actually works in their experience (Participant no. 15).

As the above examples demonstrate, physicians sometimes share their clinical experiences and stories on social media which usually carry critical tacit knowledge of people who experienced something important in their clinical practice. However, as the participants stated many times, storytelling on social media, particularly when people wish to talk about mistakes, unexpected results, or unsuccessful plans, might be better approached if there is mutual trust between individuals.

5.5.3 Multimedia oriented storytelling

Supporting multimedia components was mentioned as another advantage of storytelling on social media as it allows for the possibility of integrating other media elements such as images, audio, and video formats to support the story. The participants reported that several times they had posted clinical images such as an ECG, a picture of a rash, X-ray images, or video presentations of clinical procedures to explain or demonstrate something very efficiently. The possibility of employing multiple media enables the storyteller to frame the story effectively and illustrate the experiences in a useful way. In addition, multimedia-oriented storytelling on social media suits some people's preferred way of learning.

The multimedia feature of social media and its effect on tacit knowledge sharing was already discussed under the theme of "practising". The multimedia feature of social media is not only useful for practice demonstration and learning but is also a bonus for storytelling, as stated by the participants of the study. Today, creating audio-video files is much easier than ever before. Many physicians have digital cameras or mobile and tablet devices with built-in cameras that enable them to easily record particular events and topics of interest. As a result, creating podcasts and vodcasts is now very popular among physicians who are active users of social media.

Life in the Fast Line, for example, which was said by the participants to be one of the famous medical blogs, has collected more than two thousand podcasts and

vodcasts related to clinical practice that have been shared by many enthusiastic physicians on various medical blogs. Most of these podcasts and vodcasts contain stories from the workplace that are great sources of job-specific tacit knowledge. Physicians usually share their unique approaches and experiences in diagnosing, critically evaluating, and managing challenging clinical situations in these podcasts and vodcasts. They also support their opinions with stories from their own experiences of how they approached and managed a situation, what were the outcome and consequences, what really worked or probably had not worked, and so forth. Examples of participants' perspectives of the multimedia aspect of social media have already been provided in previous sections. Here are some other examples that show how the use of multimedia files supports clinical stories shared on social media.

> *It's pretty easy to … use text or talk interview, talk about patients, I, a lot of the audio and video programming I do talking with other colleagues as discussing challenging cases without clear answers and then recording our discussions and putting them online for everyone to use* (Participant no. 5).

> *That's pretty much the basis of most of my online blogging the cases that I put up there I usually take an interest in image or a video or something that I can use as a learning point and put that on there* (Participant no. 18).

As the above examples show, physicians also use multimedia components on social media as a means by which they can share their workplace stories, knowledge, and experience. This ability to use multimedia components on most social media platforms provides a rich media for storytelling and therefore, for tacit knowledge sharing.

5.5.4 Theme summary

Tacit knowledge transfer is primarily associated with the sharing of experiences and knowledge acquired in the workplace. Storytelling is regarded as one of the oldest ways to share job-specific knowledge and experience. Stories provide an opportunity for the listener/reader to become immersed in the story and virtually experience what has already been experienced by other people. Stories carry rich contextual information along with personal opinions and experiences which are central to tacit knowledge sharing.

The study found that social media provides an appropriate place for physicians to tell their clinical stories in a more effective and interactive way. The theme that

discussed this aspect of social media and its potential in facilitating tacit knowledge sharing was labelled "storytelling". The theme argues that social media sites, particularly blogs as well as podcasts/vodcasts, easily enable physicians to talk about or write down their clinical stories and experiences more effectively than can be done with other written formats of storytelling. In fact, social media platforms are primarily driven by the basic human need to tell and share stories (Strahovnik & Mecava, 2009).

In addition, stories told on social media can be supported with multimedia elements such as pictures, audio-video components, and presentations. There is also the possibility to engage in conversations about the stories shared on social media. Furthermore, sharing clinical stories on social media allows physicians to crowd source answers to a problem and to discuss various treatment plans based on the available evidence, although there might not always be a lot of solid evidence to support the story.

One of the major differences between storytelling on social media and other formats of storytelling, according to the participants, is that the stories shared on social media are more distilled, written in a sense-making format, and backed up with available clinical evidence as well as the literature. This process of crystallising and modifying the actual story may lead to the loss of a certain amount of subtlety in the story. However, connecting the story with previous evidence and knowledge makes it more meaningful and acceptable for others than just telling simple anecdotes. Indeed, the synthesis of day-to-day practical knowledge with academic literature was the most valuable thing participants found in social media.

Another difference between storytelling on social media and written stories in other media is the possibility of interaction about the story on social media. Readers do not just simply read or listen to a story on social media; they are also able to communicate with the storyteller or any other colleagues talking about the story. In other words, disconnection with the storyteller is not a major issue any more in stories being told on social media. The ability to edit or update the story is also another advantage of storytelling with social media tools. In fact, compared to traditional storytelling, the audience of stories shared on social media are not only simple listeners or readers but also active learners and contributors who can help to enrich the story by sharing their own knowledge and experience.

Despite the advantages of storytelling on social media over other written formats of storytelling, it is still not as effective as oral storytelling. Issues such as being taken out of context, lack of possibility to transfer emotional and non-verbal cues, and inefficiency in transferring deep, skill-based knowledge still exist in stories told on social media. However, the most serious problem of clinical storytelling on social media, according to the study participants, is maintaining patient confidentiality which sometimes prevents physicians from talking easily about their everyday experiences.

5.6 THEME FIVE: ENCOUNTERING

Encountering new knowledge and information was another theme that emerged from the data. Information encountering has been defined in the literature as a process of finding useful and interesting information while seeking or browsing for some other information. It may also happen while doing other routine activities (Erdelez, 1999). Accordingly, encountering in this study is defined as the extent to which the participants may encounter new knowledge and information as a result of interacting with peers, reviewing Twitter or blog updates, or while searching for specific information on social media sites. This also covers mechanisms that enhance the visibility and availability of existing knowledge which then increases the participants' encountering more knowledge.

Unlike other themes of the study, the theme encountering is mostly about explicit rather than tacit knowledge sharing. This theme was also deemed important in the process of tacit knowledge sharing because, as Nonaka & Takeuchi's knowledge creation model (1995) and Polanyi's (1966) argument of interaction between focal (explicit) and subsidiary (tacit) awareness also implied, tacit and explicit knowledge have an interactive relationship such that the creation of one depends on the other. That is, interaction with existing explicit knowledge and exposure to information from various perspectives and sources are essential for creating and capturing new tacit knowledge (Dinur, 2011; Marwick, 2001; Raisanen & Oinas-Kukkonen, 2008). Increased interaction with existing explicit knowledge may then facilitate the internalisation and creation of new tacit knowledge. In other words, the more existing knowledge is available and visible for knowledge seekers, the more cutting-edge ideas and tacit knowledge might be created and shared.

The study found that, as acknowledged by the majority of the study participants, social media has a much greater ability to increase knowledge encountering in comparison to any other traditional media. The data showed that social media facilitated participants' encountering existing knowledge in a number of ways, which constructed the centre of the theme of "encountering". Table 5.5 shows a summary of codes associated with this theme.

Table 5.5

Characteristics of Theme 5 (Encountering)

Theme 5	Codes included in this theme were referred to:	CR*	CS**
Encountering	- Broadcasting/publicising information	18	11
	- Faster dissemination of information	33	15
	- Personalised and filtered information feed	40	20
	- Keeping up-to-date	43	20
	- Documentation of knowledge and experiences	21	11
	- Retrievability	11	9
	Total	166	24

* Coding references; ** Coding sources

The major codes associated with the theme of "encountering" were identified as the following: broadcasting and publicising information to a wider audience, faster dissemination of information, personalised and filtered information feed, keeping up-to-date, documentation of knowledge and experiences, and retrievability. All these processes help existing knowledge to become more available to the clinical communities, hence increasing the chance of creating and sharing new tacit knowledge.

A detailed discussion of each code associated with the theme of "encountering" is provided in the following sub-sections.

5.6.1 Broadcasting/publicising information

The study participants stated that social media has great potential for increasing information visibility and encountering by providing an opportunity to broadcast and publicise information and knowledge. Social media has the potential of getting in touch with larger audiences, and also offers services such as auto posts, tagging, links, subscribing, and news feeds. These all provide better opportunities for publicising information and knowledge compared to traditional ways of disseminating information. As one of the study participants observed:

It's a good place for advertising what you do elsewhere. Like if you just write a blog and don't tell anyone no one is going to read it whereas if you publicise it on Twitter people will look at it (Participant no. 2).

Social media allows information to circulate virally among much larger communities from all over the world. According to the study participants, the maximum people who read your paper or hear your presentation in a traditional method is fewer than one or two hundred, while on social media, your potential audience is a million. A wider audience significantly affects the speed and the reach of information dissemination.

Broadcasting blog posts, presentations, journal papers, and live tweeting of conference highlights via Twitter were common among the participating physicians. Social media provides easy access to the print world. It is a good place to advertise and highlight studies or works that have been published somewhere else. It drives traffic toward already published material. It also provides an opportunity for pre-publication review by peers before they appear in hardcopy. A participant shared his experience of publicising his own publication on social media as follows.

I write for EP-Monthly and I write occasionally for Medscape and I do some peer reviewed articles as well and I try to use social media sometimes to highlight these articles and drive traffic toward them so that we can foster a discussion (Participant no. 13).

Social media creates a cycle of information by providing links to information published via other means, be it online or in print. The majority of participants viewed this as one of the great advantages of social media in that it brings information to you that you perhaps would not have known about or found otherwise.

Broadcasting on social media among physicians is not limited to already published materials. Participants also talked about other types of knowledge such as sharing particular clinical skills, tips, ideas, and thoughts which had become popular as a result of sharing on social media. Examples of these skills were provided in the discussion on theme two, "practising".

5.6.2 Faster dissemination of information

Faster dissemination of information is another advantage of social media mentioned by the study participants that has the potential to increase the chance of encountering new knowledge and information. The majority of the participants

believed that social media makes information and knowledge easily and readily available to the community, compared to traditional mechanisms of publication which always have a long delay. They talked about how they liked the speed of information sharing on social media through having a worldwide reach. For example, a participant stated that,

> *I like the being able to get information out very rapidly … I really like the worldwide reach* (Participant no. 16).

Participants appreciated the immediacy of social media, the immediate availability of comments and tweets, and also the ability to view articles even before they get published as a result of discussion with the authors of the articles. For example, a participant said,

> *The main thing … is the immediacy of the social media world. So the fact that I can see an article that's not yet in print and immediately read it* (Participant no. 12).

Participants provided several examples of how social media exponentially accelerates knowledge and information sharing among physicians. For example, a participant talked about a specific clinical technique that had taken several years from its initial publication in a journal to become best practice, whereas Scott Weingart's technique, for example, which was published on his blog with supporting multimedia elements, became widespread within weeks and was incorporated into the practice of many clinicians in a short time.

Although Weingart had already published his paper in a journal, it had not received much attention. The reason, according to the participants, was that the majority of practitioners do not read many of the scientific journal papers. They are not interested in spending time and paying money for a basic science journal that may or may not matter to them. Instead, they use Twitter and RSS feeds as main sources of information. They subscribe to the social media feeds of important journals in their field, such as the *New England Journal of Medicine*, *BMJ*[4], or *JAMA*[5] and if they find an interesting article, they then follow the links. In addition, the new format of information sharing on social media allows for interactive communication among sharers about the content shared, and this was not possible in the traditional format.

[4] British Medical Journal
[5] Journal of the American Medical Association

An example of a participant's comment on how social media is more effective than traditional journals is provided below.

> *It's on your phone … it's an easy way to stay up-to-date with information rather than the stack of journals that I have sitting at home collecting dust because I never really have time at home to read through all the journals* (Participant no. 17).

According to the participants, faster dissemination of information is vital in the medical field. If you hear about a solution in a week versus two years from now, several patients' lives potentially might be saved in the interim. Information is time dependent and becomes fairly irrelevant quickly if it is not disseminated in an appropriate time. Unlike a journal that comes out once a month, social media is updated 24/7, 365 days a year, which means that it almost provides real-time information. It can be argued that in a traditional academic publication, if information becomes visible to the user in two or three years from its early draft, the information on social media moves on a minute, hourly, or daily basis.

In addition, social media not only helps faster dissemination of already published information, but also helps faster publication of new information. Sharing information on social media simply starts by just creating a new account and is accessible and achievable for anyone compared to the traditional methods which were regarded by participants as expensive, cumbersome, time consuming, and suffering from long delays.

5.6.3 Personalised and filtered information feed

Another advantage of social media that participants were very interested in was the personalised and filtered information feed. Information anarchy is one of the main challenges of online information, particularly if it is published on social media. Participants viewed seeking information individually and sieving relevant from irrelevant information as a quite time consuming effort. No one can read and evaluate all journal papers. However, social media serves like a journal club for physicians who participate in social media in which everyone who has read something new and important shares it with other colleagues immediately. Indeed, it works as a platform for a collective reading and evaluation of the literature. The following two interview excerpts illustrate how social media helps physicians by providing personalised and filtered information feeds.

The fact that it's filtered by experts or other enthusiasts who have similar objectives to you means that it tends to be things that actually appeal to you more or are more useful than just trawling blindly through other resources, traditional resources (Participant no. 15).

What I like looking both at Twitter and other people's blogs are mainly just because there's so many articles being published every week I kind of use Twitter as a filtering device to see what people are talking about and which articles I should pay closer attention to (Participant no. 17).

As the above examples demonstrate, social media helps physicians to determine what is the most important and valuable information to read, according to their colleagues' viewpoints. Social media tools such as Twitter and blogs have features that enable users to define exactly who and what resources to follow and these serve as a way of screening vast amounts of information available on the Internet for physicians.

Access to information which is already evaluated and filtered by experts or other enthusiastic colleagues ensures that the information shared is relevant, high quality and peer reviewed. Peer review in social media, according to the participants, is "rapid and potentially brutal". This means that if something incorrect is shared on social media, it will receive strong responses in a short time. This prevents sharing the wrong information among the community. Accordingly, trust is an important factor in choosing who to follow. Therefore, creating a list of trusted people on a given topic is necessary in social media interactions.

5.6.4 Keeping up-to-date

Keeping up-to-date is one of the most important challenges that physicians face in their profession (Laine & Weinberg, 1999; Yew & Reid, 2008). Today, information travels faster than ever before and clinical practice is constantly evolving. The ability to keep track of the latest information and developments is important in clinical practice. Social media is regarded by the study participants as one of the most effective ways to keep abreast of what is happening internationally in the field. The majority of participants believed that social media exposed them to more up-to-date information, which resulted in obtaining more knowledge.

Participants stated that they were checking their Twitter accounts or RSS feeds regularly to view headings and summaries of information shared by their trusted colleagues and sources. Twitter and RSS feeds indeed serve as a kind of alert system

for newly published material. As soon as a new journal paper, a blog post, a presentation, or an interesting tweet is shared by pre-selected sources, they will appear in the user's account. The user can then review and decide to read the details of the materials of interest.

Participants acknowledged that prior to the use of social media, their ability to obtain new knowledge was limited to local colleagues and a few journals if they could find the time to read them. However, their ability to incorporate new knowledge had exploded since entering the social media world. Examples include being able to quickly review newly published literature and controversial topics, being informed of new evidence, techniques, and advances, being able to engage in professional conversations, or just reading people's opinion and comments. From the participants' perspectives, physicians who use social media regularly are much more up-to-date than physicians who do not use social media. The following interview extract shows an example where a participant compared herself with her colleagues who do not use social media.

> *I just flick through my Twitter all the time … Just pick out individual things and it can take me five minutes to read … I'm constantly up-to-date. And I can now very much notice there's a big difference between myself and my peers who are of a similar vintage who don't use social media by far. I am always up-to-date with the latest stuff and they're not now ... It's not because I spend lots of time studying and reading it, because I'm just now awash with this conversation going on* (Participant no. 11).

There were also examples where participants believed that social media assisted them to be a better physician, that their understanding of clinical practice in an emergency department was much more developed due to their participation in the discussions on social media and becoming more up-to-date.

> *I think it makes me a better physician for a number of reasons. I think I'm much more up-to-date than I otherwise would be … I believe I have access to a greater pool of expertise than I would … I think that my understanding of things like risk management in the emergency department and … are much more developed* (Participant no. 12).

In addition, the social aspects of social media motivate physicians to read much of the literature to keep up with others. It also creates commitment and encourages the participants to contribute more to the community in order to be in the circle. This is well illustrated by Participant no. 23 as the following extract shows.

> *The social aspect of it makes me want to read up more on the standard journals as well because you meet people with a lot of knowledge and you want to give that back*

and you want to read more about what they are talking about or asking you about (Participant no. 23).

5.6.5 Documentation of knowledge and experiences

Tacit knowledge needs to be documented when it is articulated and converted to explicit knowledge (V. S. Lai & Guynes, 1997; Palanisamy, 2007; Mohamad Hisyam Selamat & Choudrie, 2007). Tacit knowledge is articulated when it is crystallised and converted to explicit and readily understandable knowledge. Tacit knowledge can be articulated using several methods such as dialogue, storytelling, metaphors, analogies, annotations, and demonstrations. Once tacit knowledge is articulated either in an oral, written, or visual format it needs to be stored for future use or for further discussion (Palanisamy, 2007; Sanders, Steward, & Bridges, 2009; C. C. Wang & Qiu, 2011; Yu, 2010). Otherwise, that valuable tacit knowledge will be lost or will remain shared between a limited number of people with no benefit for others.

This study found that, as observed by a number of participants, social media is also helpful in documenting articulated tacit knowledge. Indeed, one of the main reasons of using social media tools by physicians was to document and store their professional experiences, lessons learned, or some important information they found in the literature. They mentioned that they were using social media tools, mainly blogs, like a personal notebook to write down and store their particular findings or thoughts in order to use them in the future by themselves or to share with other physicians to develop discussions about them.

Two examples of participants' views regarding documenting tacit knowledge on social media are provided below.

Me and my colleague who writes our blog, we mainly use it to sort of document our own stories and to keep it as a base for what we've learnt and experienced and found (Participant no. 23).

It also helps me in archive times ... if I have taken the time to research something and review something then I'll be able to store that Information on the blog post ... I can then go back to that. I can hit that links to somebody else ... (Participant no. 1).

As the above examples show, writing blogs has been a way of archiving tacit and also explicit knowledge for physicians. Although blogs were used as the main tool to document tacit knowledge, participants mentioned using other tools such as wikis, podcasts, and YouTube to store and share tacit knowledge. It can be argued

that these social media tools serve as repositories of tacit knowledge that has been articulated, communicated among participants, and archived there almost permanently.

A variety of formats such as text, photo, audio, and video are used to archive tacit knowledge on social media. Examples of documenting tacit knowledge in a text format included particular tips, personal ideas, and professional opinions written down during chats and discussions in the Twitter sphere, or the comments written about a blog posts, or a vodcast/podcast shared on a multimedia media site. Sharing clinical images such as x-rays, ECGs, and ultrasound images, sharing audio files of discussions between experts on podcasts, and sharing recorded videos of performing practical procedures and skills in multimedia channels were other formats of storing tacit knowledge in social media space. Documentation of tacit knowledge may not be limited to just storing it in explicit forms; it can also be stored in the relations initiated and developed on social media.

The key advantage of storing information and knowledge on social media sites is that they are archived there permanently. As one of the participants stated, "*it's all there and accessible and archived*" (Participant no. 12). The permanent storage of contents on social media is followed by permanent availability to a wider audience which is another advantage of storing information on social media. The permanent storage and availability of social media contents allows users to revisit the content shared as many times as they want. This helps users to refresh their memory or learn something new each time they visit, according to the participants.

As far as articulating tacit knowledge is concerned, it has to be noted that definitely not all parts of tacit knowledge are codifiable and hence storable on social media. Every attempt to externalise tacit knowledge and convert it to explicit knowledge is accompanied by losing some of its distinctive properties. However, the interactivity and social aspects of social media allow for ongoing discussion and questioning about any ambiguous parts of the knowledge shared.

Documenting knowledge might be regarded as the final stage of the tacit knowledge sharing process as at this stage it is articulated and converted to explicit knowledge. However, viewing knowledge as a continuum of tacit-explicit rather than a dichotomy of tacit vs. explicit knowledge, it can be argued that the tacit dimension of some of the documented tacit knowledge, particularly that which is archived in

chats, conversations, videos, and also that which is maintained in relations, is still stronger than its explicit dimension.

5.6.6 Retrievability

Retrievability of articulated tacit knowledge was also mentioned as another advantage of social media. Once tacit knowledge is codified and converted to a written format it is easily possible to retrieve it on social media. Social media contents are public and can also be searched using popular search engines such as Google, Yahoo, and Bing. In addition, tagging is a great way to organise and enhance the retrievability of contents shared in social media space. For example, participants adored the use of hashtags (e.g. #hcsm, standing for topics related to healthcare and social media or #FOAMed, standing for Free Open Access Medical Education) to tag their tweets with searchable and personalised keywords on Twitter. The hashtags enable both followers and non-followers of a given topic or account to easily search and follow topics of interest on Twitter.

The following interview excerpts show examples of participants' views in regard to the searchability of social media tools.

> *Twitter has improved their searching and because you can search locally and because you can have these hash tags, I find it's really great at conferences and really great for conversations on a specific theme* (Participant no. 13*).*

> *[Blogs] are searchable forums so that if you want to go back and read something later on or if you need to refresh your memory blogs are the best way to do it* (Participant no. 18).

As the above examples show, social media tools provide opportunities to search articulated tacit knowledge on a specific topic either by employing personalised tags or through popular search engines. As a result, the chance of encountering new information and knowledge increases among users.

While it was found that social media provides great opportunities for knowledge encountering through providing better facilities for broadcasting and faster dissemination of information, keeping people up-to-date, enabling to document and retrieve personal knowledge and experiences, it was also found that information anarchy is still one of the major issues of knowledge seeking on social media. Information anarchy generally describes a situation where there is no formal information management policy and no hard control of data (Davenport & Prusak,

1997). Information anarchy on social media can also be defined as a state where finding the relevant information is difficult due to the less organised and chaotic nature of information created and shared.

According to the study participants, social media has mixed users, which range from, for example, fans of music bands to professionals and scientists who are participating on a single platform simultaneously. Social media is primarily a place for social conversations. Even conversations among professionals are mixed with both social and professional conversations. There is no strict regulation and control of data shared on social media. Consequently, an amalgam of information is shared and available to physicians who participate on social media. This information anarchy makes it sometimes difficult for physicians to find relevant information. The following two interview extracts illustrate the point discussed.

> *It's open access, so you're going to get some rubbish but that's your job as a professional to sort out the rubbish from what's actually genuine and useful* (Participant no. 6).

> *There's actually a lot of good stuff on there [YouTube]. The problem is that you have to wade through quite a lot of crap to find it* (Participant no. 15).

As these examples demonstrate, social media is not as organised as other knowledge databases. Beginners usually find it challenging and tedious to find their way on social media. For example, Twitter posts quickly disappear into the large void of other posts. The structure of wikis or blog pages also makes it difficult to locate information quickly. There is a search function on social media platforms, but it is not very efficient. In addition, there is much background noise such as advertisements, marketing offers, and spam, which make it sometimes difficult for physicians to concentrate on their main purpose.

According to the study participants, there is always a need to filter out relevant content as well as relevant people on social media due to its openness and the diversity of its users. Therefore, as recommended by the study participants, the first step on social media is probably to create a list of like-minded people and trusted sources. The list can be altered over time by observing the sharers' online presence and determining their trustworthiness and relevance. There should also be the ability to block those who are not reliable or not relevant anymore. Some tools (for example, Twitter) have this ability.

5.6.7 Theme summary

Tacit knowledge creation relies not only on personal experiences and knowledge acquired at the workplace, but also depends on the availability and adequate consumption of existing knowledge and information. The increased interaction with existing knowledge provides more possibilities for internalising the assimilated knowledge which then establishes more opportunities for creating new tacit knowledge.

This study found that social media has increased physicians' encountering existing knowledge in several ways. It provides greater opportunities for physicians to publicise already published medical information to a much larger audience. It maximises the speed of information flow among the clinical community. It provides a more customised and filtered information feed for physicians. It helps physicians to always keep up-to-date. It also supports documentation and retrievability of articulated tacit knowledge.

The theme of "encountering" argues that social media facilitates the "internalisation" process of explicit-to-tacit knowledge conversion by making knowledge and information more visible and available to the clinical community. In other words, it increases the chance of assimilation of new knowledge and the incorporation of that knowledge with the receiver's prior knowledge and experience in order to make new tacit knowledge.

Despite the advantages of social media for increasing the chance of knowledge encountering, it was also found that information anarchy is one of the major challenges of adopting social media that sometimes limits the ability to find the most relevant information, in particular for beginners.

5.7 CHAPTER SUMMARY

In summary, the data analysis revealed five emerging themes and over twenty sub-themes that could be regarded as the potential contribution of social media to facilitating tacit knowledge sharing, according to the perspectives and experiences of the study population, physicians. The five themes identified in the study were: socialising, practising, and demonstrating practical skills, networking with colleagues globally, interactive storytelling, and encountering. Table 5.6 shows a summary of the total themes and sub-themes identified in the study.

Table 5.6

Total Themes and Sub-Themes Identified in the Data Analysis

Themes	Codes included in this theme were referred to:
Socialising	- Dynamic conversations and discussions - Question and answer - Instant communication - Commenting - Open participation
Practising	- Practice demonstration - Learning practical skills - Benchmarking best practice
Networking	- Expert locating - Inter-organisational networking - Cross-disciplinary interaction - Professional collaboration
Storytelling	- Case reporting - Sharing personal experiences & lessons learned - Multimedia oriented storytelling
Encountering	- Broadcasting/publicising information - Faster dissemination of information - Personalised and filtered information feed - Keeping up-to-date - Documentation of knowledge and experiences - Retrievability

As shown in Table 5.6, each theme was constructed by combining a series of codes and sub-themes that were strongly believed to be associated with the theme. The themes and sub-themes were discussed in this chapter, using the data, and were supported with examples of quotations from the study participants.

In addition, some challenges of tacit knowledge sharing through social media (for example, limited richness of social media compared to face-to-face interaction, lack of active participation, anonymity and the issue of trust, problems with protecting patient privacy, and information anarchy) was also discussed.

Furthermore, as with face-to-face communication, the importance of trust in the process of tacit knowledge sharing on social media was also acknowledged. It was found that physicians trust their peers on social media mainly through approaches such as previous personal interactions, authenticity and relevancy of voice, professional standing, consistency of communication, non-anonymous and moderated sites, and peer recommendations.

The chapter presented the main findings of the study related to the main question of the study. The next chapter will provide a detailed discussion of the findings in relation to the literature.

Chapter 6: Discussion of the findings

6.1 CHAPTER PREVIEW

The previous chapters presented the main findings of the study in relation to the main question of the study, "*how social media tools facilitate tacit knowledge sharing among physicians*". In summary, the study found five emergent themes with over twenty sub-categories in regard to tacit knowledge sharing among physicians on social media. The themes included: socialising, practising, networking, storytelling, and encountering.

A detailed description and discussion of each theme was provided in the previous chapter. The purpose of this chapter is to discuss the theoretical relationships of each theme with existing literature as well as in relation to other themes of the study, and finally to propose an overarching conceptual model that explains the predominant facilitators of tacit knowledge sharing in a social media context. Before discussing the main findings of the study, first a brief overview of the study findings in relation to the main objectives, specified at the beginning of the study, is also provided in the following section.

6.2 REVISITING THE OBJECTIVES OF THE STUDY

As presented in Chapter 1 of the thesis, *Introduction*, five major objectives were outlined for the current study. The first objective was to explore the patterns and nature of knowledge being shared among physicians on social media. To achieve this purpose, a series of open-ended questions were asked from the participants of the study during the interview to uncover the types of knowledge physicians usually share on social media. As presented in Chapter 4, by adopting a continuum of tacit-explicit knowledge, this study revealed that physicians share various types of both tacit and explicit knowledge on social media.

Examples of explicit knowledge shared by physicians on social media included: sharing contents from literature, presentations and lecture notes, medical news and events, peer-reviewed links, and profile sharing. Examples of tacit knowledge shared by physicians on social media also included: sharing clinical experiences, practical tips, personal expert opinions, cutting-edge ideas, topics,

issues, and advances. The findings of the study here confirmed previous findings reported in the literature (Chatti, et al., 2007; Dave & Koskela, 2009; Gordeyeva, 2010; Jarrahi & Sawyer, 2013; Nilmanat, 2011; Wahlroos, 2010) that tacit knowledge sharing also occurs on social media space. However, most tacit knowledge shared on social media among physicians seems related to articulable tacit knowledge rather than to absolute and inarticulable tacit knowledge. Next, the study intended to explore what potential exists in social media that facilitates this process of tacit knowledge sharing among physicians, as outlined in the second objective of the study.

The second objective of the study, which was the main objective of the study, was to explore and explain the possible applications and contributions of social media in facilitating tacit knowledge sharing among physicians. The study achieved this objective by identifying five major themes and over twenty sub-themes. As these findings were the main findings of the study, they will be discussed separately in the following sections.

The third objective of the study was to develop a conceptual model showing the main potential contributions of social media in facilitating tacit knowledge sharing. This objective is strongly associated with the second objective of the study. The associations between the themes of the study and the research question are illustrated in a conceptual model. This will also be presented in the following sections of this chapter.

The fourth objective of the study was to investigate the use of social media tools by physicians, including their pattern of use, reasons, and the challenges they experience while using these new platforms. As presented in previous chapters, the study achieved this objective by revealing how and why physicians use social media, and what challenges they encounter when using social media. The study showed that blogs, Twitter, and multimedia sharing sites were the three main social media tools that the majority of the physicians who participated in the study were interested in and used frequently.

The study findings related to the physicians' use of social media raise questions about some of the findings of previous studies that concluded that the most used social media tools by physicians were physician-only social networks (McGowan, et al., 2012) or Facebook, YouTube, and LinkedIn (Antheunis, et al., 2013). However,

findings of the current study in this regard are not sufficiently generalizable and comparable with previous studies due to the small sample size of the study (twenty-four participants).

The study also uncovered that the main reasons that attracted physicians to the use of social media were: staying connected with colleagues, reaching out and networking with the wider community, sharing knowledge, engaging in continued medical education, benchmarking practice, and personal professional branding. Few studies highlighted the reasons for adopting social media tools by physicians. For example, Usher (2012) found that Australian physicians adopt social media because it provides a quick and effective way to communicate; has the ability to be used effectively; is appealing for younger patients; they have had requests from patients; it is enjoyable; it has ease of mobility; and it provides a forum for finding relevant health information.

Hughes et al. (2009) have also revealed that junior physicians are interested in Web 2.0 tools because of their ease of use, their structure and the breadth of information that these sites provide. Some studies also found that social media is useful for continuing medical education (Hughes, et al., 2009; Schweitzer, Hannan, & Coren, 2012). More recently, Antheunis, Tates, and Nieboer (2013) found that healthcare professionals use mainly LinkedIn and Twitter to communicate with colleagues, extend their network, share knowledge and news, and also to promote their services. The current study, while acknowledging some of the previous findings, provides a more overarching view of why physicians use social media.

In addition, the study revealed that physicians encounter several challenges while using social media. As discussed in several places in previous chapters, the main challenges included: maintaining confidentiality, lack of active participation, finding time, lack of trust, workplace acceptance and support, and information anarchy. These findings support the previous findings that preserving patient privacy (Barnett, Jones, Bennett, Iverson, & Bonney, 2013; Mitra & Padman, 2012; Thompson et al., 2011) is one of the major barriers in social media adoption in healthcare. It also supports some of the other findings of previous studies, such as lack of support and the need for regulation and appropriate policy (Househ, 2012; Li, 2013), lack of time (Barnett, et al., 2013; Usher, 2012), lack of understanding of the actual benefits of social media in healthcare, and the potential risk of developing

addictive behaviours (Usher, 2012). The study also revealed new challenges such as the lack of active participation and information anarchy as other important challenges that physicians experienced when adopting social media.

Furthermore, the study revealed that as with the face-to-face communication (Castelfranchi, 2004; Holste & Fields, 2010; I. L. A. Lai, 2005; D. Song, 2009; Yang & Farn, 2009), mutual trust is very important in the process of tacit knowledge sharing on social media. While many studies have shown that mutual trust is necessary for online communication and knowledge sharing (Chiu, et al., 2006; Hsu, Ju, Yen, & Chang, 2007; Son & Kim), few have actually explored how people establish and sustain trusted relationship on social media (Grabner-Kräuter & Bitter, 2013).

The current study showed that physicians develop trust differently on social media. The participants of the study had mixed views about trusting people on social media. A group of participants viewed trust as a main challenge in social media interactions due to the open and anonymous nature of social media. On the other hand, a group of participants, particularly senior physicians, believed that there is not a significant difference between trusting people on social media and trusting people in face-to-face communication or trusting academic publications. This group believed that trust is attainable on social media and that it can be built over time, provided certain approaches are followed.

Despite the various opinions held, it was obvious that physicians do not easily trust other people on social media when the information is related to medical knowledge and practice. Social media is open to everyone regardless of their educational and professional qualifications and anyone can pretend to be anything or speak more authoritatively than other people on social media. There is no close or face-to-face interaction among social media participants in which they are able to easily assess someone's trustworthiness. Authors' credentials are not always assessable on social media. Consequently, there might be a lack of trust or a reluctance to accept what has been shared on social media.

It was found that the majority of physicians established their trusted relations on social media mainly through the following approaches: previous personal interactions, authenticity and relevancy of voice, professional standing, consistency of communication, non-anonymous and moderated sites, and peer recommendations.

Although the study participants proposed several ways to develop trust on social media, face-to-face interaction was still recommended as the best way to establish mutual trust. Trust is easily attainable in face-to-face communication when there is eye contact, the exchange of non-verbal cues, and the possibility of assessing people's confidence and competence. As discussed in previous chapter, the majority of the study participants initiated the development of their network of trust on social media by connecting first with people who they already knew or had met in person. Many people's online interactions translate their authentic relationships in real life.

In summary, developing trust on social media does not occur as quickly as it does in face-to-face interactions. It is built up over time and via regular reciprocal communication that provides opportunities for better knowing and understanding each other. Lurkers and random contributors would rarely be able to establish mutual trust on social media. Lack of trust is still one of the biggest barriers in online communications.

This section briefly revisited the main research objectives and corresponding findings. The next section, as mentioned above, will discuss the main findings of the study, in other words, five themes of the study in relation to tacit knowledge sharing on social media.

6.3 DISCUSSION OF THE THEMES OF THE STUDY

As discussed in the literature review, there is a major debate among researchers in the literature about the actual contribution of information technology to tacit knowledge sharing. A large group of researchers does not view any particular role for technology in the tacit knowledge sharing process (For example, Flanagin, 2002; Haldin-Herrgard, 2000; Hislop, 2001; Johannessen, et al., 2001), while another group of researchers views it as having some potential (For example, Alavi & Leidner, 2001; R. Harris & Lecturer, 2009; Hildrum, 2009; Marwick, 2001; Murray & Peyrefitte, 2007; Stenmark, 2000). In particular, after the introduction of Web 2.0 and social web tools in the resent decade some researchers argued that these new emerging technologies may alleviate some of the issues existing in tacit knowledge sharing using information technology (Dave & Koskela, 2009; Gordeyeva, 2010; Lopez-Nicolas & Soto-Acosta, 2010; Steininger, et al., 2010; Zheng, et al., 2010).

Although the second group argued that information technology might be useful in facilitating tacit knowledge sharing, almost none provided a conceptual model or identified and demonstrated how information technology may contribute to tacit knowledge sharing. Most presented sporadic arguments with little detail and few provided empirical data to support their arguments. Therefore, the current study aimed to fill parts of this major gap in the literature by investigating and conceptualising how social media could facilitate tacit knowledge sharing, according to the physicians' perspectives and experiences.

The key findings of the study relating to the main purpose of the study (social media contribution to tacit knowledge sharing) included five major themes and over twenty sub-themes that were found to be effective in facilitating tacit knowledge sharing on social media. The themes included:

- Socialising
- Practising
- Networking
- Storytelling
- Encountering

The themes identified in the study not only highlighted and organised some of the isolated arguments in the literature in regard to technological support for facilitating tacit knowledge sharing but also explored and identified new concepts and meaning while investigating tacit knowledge sharing over social media space. The study has connected the determinants and mechanisms of tacit knowledge sharing in a face-to-face context with features and the potential of social media that facilitate this process. In addition, the study supported those arguments with empirical data collected from the healthcare context while most previous studies lacked empirical data support.

As mentioned above, some of the main themes identified in the study were strongly aligned with the literature findings related to face-to-face tacit knowledge sharing. These themes were revisited in a social media context and the sub-dimensions revealed for each were mostly unique. For example, socialisation and storytelling have been regarded in the literature as effective ways to exchange tacit

knowledge in a face-to-face context (McAdam, et al., 2007; Nonaka, 1994; Polanyi, 1966; E. A. Smith, 2001; Yang & Farn, 2009). However, to the best knowledge of the researcher, almost no study revealed and discussed dimensions of socialisation and storytelling, in particular in IT-mediated tacit knowledge sharing. On the other hand, the current study revealed that socialisation on social media facilitates tacit knowledge sharing through enabling people to participate in conversations and discussions, by offering opportunities for question and answer, instant communicating, and commenting. These can be regarded as new dimensions of socialisation on social media context.

Investigating the social media context was also a particular interest of the study. According to the literature, the social media context has rarely been investigated in terms of its viability for tacit knowledge sharing. As highlighted above, social media's contribution to tacit knowledge sharing has rarely been addressed in the literature. This study is probably one of the first to explore and identify social media contributions to tacit knowledge sharing.

Investigating the healthcare context and seeking physicians' perspectives and experiences in regard to tacit knowledge sharing on social media also distinguishes this study from the studies reported in the literature. As presented in the literature review chapter, despite the importance of tacit knowledge in clinical work and despite the growing interest of physicians in joining online social communities, very few studies were found to be focusing on tacit knowledge sharing among healthcare professionals in online social space.

For example, Hara and Hew (2007) in their case study of an online community of health-care have discovered that the most important activity that nurses undertake in online communities is associated with practical tacit knowledge. Curran et al. (2009) also found that the majority of clinicians in online communities are interested in the practice of their peers in order to benchmark best practices. However, they did not discuss their finding from a technological perspective and did not reveal how the platform (discussion board) supported tacit knowledge sharing among the community. In addition, the platforms they examined were traditional platforms such as online listserv and discussion boards. Social media and its potential for tacit knowledge sharing was not the focus of these studies.

In general, the literature on healthcare knowledge management (KM) was rarely consulted in the discussions about each theme of the study due to the lack of literature on this subject. Although the healthcare KM literature (Abidi, et al., 2009; Curran, et al., 2009; Hara & Hew, 2007) had confirmed the potential of exchanging personal, practical, and experiential knowledge in online communities, little of this literature discussed the mechanisms and determinants that may facilitate tacit knowledge sharing on an online space.

In the following section, each theme of the study (socialising, practising, networking, storytelling, and encountering) is discussed separately with reference to the literature.

6.3.1 Socialising

As presented in the literature review, socialisation, participating in social gatherings, interacting with others for some common purpose, and developing informal conversation and discussion, has been regarded as one of the main enablers of tacit knowledge sharing (McAdam, et al., 2007; Nonaka, 1994; Polanyi, 1966; E. A. Smith, 2001; Yang & Farn, 2009). Socialisation encourages people to share their knowledge and experience, facilitates common understating and crystallisation of individuals' hidden knowledge, and provides foundations for the exploration and generation of new ideas.

Despite the extensive literature highlighting the importance of socialisation, conversation, and dialogue for tacit knowledge sharing in a face-to-face context, very few studies have highlighted that tacit knowledge sharing may occur through virtual communications in an online environment. For example, Marwick (2001) argued that online discussion forums, chat rooms, and other real-time online interactions to some degree can constitute a shared experience to facilitate tacit knowledge sharing among team members.

Lai (2005) has also confirmed the possibility of transferring tacit knowledge in Internet discussions and chat sessions. Furthermore, Wahlroos (2010) argued that the emerging social media seems to represent a significant potential for facilitating tacit knowledge sharing by providing live conversations among individuals. However, most of these studies lack empirical data support for the arguments made and do not

demonstrate in detail how socialisation using web-based technology, in particular on social media, may support tacit knowledge sharing.

Consistent with the literature, the current study also indicated that as in the face-to-face context, socialisation on social media has the potential to facilitate tacit knowledge sharing, although it may not be as rich as face-to-face communication. In addition, the study revealed aspects of online socialisation on social media which had not yet been addressed in the literature. For example, dynamic conversations and discussions, question and answer opportunities, open participation, instant communication, and commenting possibilities on social media were found to be important aspects of socialisation on social media that may facilitate the flow of tacit knowledge.

In addition, the study indicated that socialisation on social media does not necessarily facilitate tacit knowledge sharing directly on online space. It can also provide foundations for future offline face-to-face socialisation and networking where actual and rich tacit knowledge transferring can occur.

Some of the dimensions identified in the study for socialisation on social media are not altogether unknown in the literature. For example, researchers (Desouza, 2003; I. L. A. Lai, 2005; Marwick, 2001; Muthukumar & Hedberg, 2005) briefly argued that online discussion forums and chat sessions have the potential to facilitate tacit knowledge sharing. Others (L. Joia & B. Lemos, 2010; Marwick, 2001; Peroune, 2007; E. A. Smith, 2001) also argued that appropriate questioning and providing a favourable environment for this to happen help elicit the hidden tacit knowledge of experts. However, none of these studies investigated the social media context and few (Peroune, 2007) supported their arguments with empirical data.

In general, there was inadequate empirical data support in the literature to determine how online socialisation may help tacit knowledge sharing. Most discussions in the literature were isolated theoretical arguments with little or no data support. However, the current study examined and highlighted these arguments with further explanation and supported them with empirical data in a healthcare context. Furthermore, the combination of dimensions found for online socialisation in the current study was unique. Most previous studies have not adequately discussed online socialisation, in particular socialisation in a social media context, and its link to tacit knowledge sharing.

It is worth noting that although the study identified some aspects of socialisation on social media (for example, socialising through dynamic conversation, commenting, and question and answer), as with face-to-face tacit knowledge sharing, the level of shared tacit knowledge among physicians during socialisation on social media was not measurable due to the multifaceted and complex nature of tacit knowledge concepts. Tacit knowledge is not easily operationalisable due to the fact that the nature of tacitness always changes according to the level of expertise (novice or expert), the time, and the context in which the knowledge is shared (Ambrosini & Bowman, 2001). However, based on the evidence, presented in the previous chapter, it can be argued that informal socialisation and dialogue among physicians on social media has the potential to facilitate sharing of knowledge with a low to medium degree of tacitness.

6.3.2 Practising

Previous studies have shown that the demonstration of a practical skill followed by observation and imitation of that skill has great potential to facilitate tacit knowledge sharing, particularly when it is done in a face-to-face manner (S. Gourlay, 2006; Guerra-Zubiaga & Young, 2008; I. L. A. Lai, 2005; Nonaka & Takeuchi, 1995; Scott, 1998). Accordingly, multimedia components such as videos, audios, and pictures have also been regarded in the literature as effective means for sharing tacit knowledge, particularly in terms of transferring technical know-how and skills (Eraut, 2000; Mavromoustakos & Papanikolaou, 2010; Nilmanat, 2011; Sarkiunaite & Kriksciuniene, 2005; Y. Wang, 2010).

Despite the extensive literature about tacit knowledge sharing through practice observation and demonstration (through both face-to-face interactions and over digital media), there is a paucity of research indicating the role of social media in this regard and how it may facilitate practice observation and demonstration and hence, tacit knowledge sharing. The current study is likely the first to investigate the potential of social media in facilitating practice observation and demonstration among the clinical community.

Several studies recently viewed online video sharing channels, in particular YouTube, as useful pedagogical tools that augment students learning (Jones & Cuthrell, 2011). Examples of these studies in the healthcare context also include indicating the usefulness of YouTube for nursing education (Clifton & Mann, 2011;

Duncan, Yarwood-Ross, & Haigh, 2013), anatomy teaching (Jaffar, 2012), dental education (Knösel, Jung, & Bleckmann, 2011), and teaching clinical procedures (Topps, Helmer, & Ellaway, 2013). However, very few studies talked about demonstrating and learning practical skills using social media channels and linking this to tacit knowledge sharing concepts. More recently, Szeto and Cheng (2013) identified demonstrating skills as one of the main affordances of YouTube that helps students to learn particular skills more easily and efficiently than using traditional teaching materials and methods. However, this study also did not link this potential of social media with tacit knowledge sharing concepts.

The current study confirmed the findings of previous studies (Eraut, 2000; Mavromoustakos & Papanikolaou, 2010; Nilmanat, 2011; Sarkiunaite & Kriksciuniene, 2005; Y. Wang, 2010) that videos, pictures, and other multimedia files are important in tacit knowledge sharing. However, the study also found that the multimedia-oriented feature of social media facilitates tacit knowledge sharing among physicians more effectively than traditional forms of audio-video presentations.

Compared to traditional technologies, it was found that social media sites such as YouTube, Vimeo, and other podcasts/vodcasts shared on blogs provide better opportunities for learning practical skills and benchmarking best practices. Interactivity and the possibility to develop ongoing discussions, comments and feedback, and also the availability and accessibility of multimedia files on social media, were all found to be superior to traditional ways of sharing tacit knowledge through multimedia components. Social media has augmented the potential of traditional multimedia presentations in transferring tacit knowledge through these emerging features that not only enable people to watch and imitate practical skills but also to comment, ask questions, and engage in discussions.

The relationship between the features of social media and tacit knowledge sharing is not adequately addressed in the literature. The current study has demonstrated that the multimedia-oriented features of social media, combined with its interactivity and user-centred features, such as enabling users to provide content themselves and enabling them to collectively view, comment, and develop discussions, make great contributions to the tacit knowledge flow among individuals.

However, despite those advantages of social media for practice demonstration and benchmarking best practices, it is still inferior to face-to-face communications which are much richer than any IT-mediated communications. Losing social cues such as body language, emotional feelings, and eye contact are argued to be major shortcomings of most computer-aided communications (Hislop, 2001; Hooff & Weenen, 2004), particularly when there is a need to share knowledge with a high degree of tacitness.

6.3.3 Networking

A great deal of the literature has been dedicated to networking and its effects on tacit knowledge sharing. Many researchers have argued that developing a strong mutual relationship is one of the main prerequisites for tacit knowledge sharing (Cavusgil, et al., 2003; J. H. Chen & McQueen, 2010; Davenport & Prusak, 2000; Fernie, et al., 2003; Haldin-Herrgard, 2000; Hansen, Nohria, & Tierney, 1999; L. Joia & B. Lemos, 2010; Peroune, 2007; E. A. Smith, 2001; Wahab & Rose, 2011). Networking helps people to connect with experts who possess tacit knowledge (L. A. Joia & B. Lemos, 2010), gives access to know-how (B.-Ä. Lundvall & B. Johnson, 1994), drives forces for sharing experiences (C. C. Wang & Qiu, 2011), fosters mutual trust (Peroune, 2007; Annick Willem, Buelens, & Scarbrough, 2006), encourages collaboration (Marwick, 2001; Muthukumar & Hedberg, 2005), and therefore, eases the transfer of tacit knowledge (Haldin-Herrgard, 2000; E. A. Smith, 2001).

The findings of the present study are also consistent with the literature that supports networking as fundamental to tacit knowledge sharing. However, the literature mostly focuses on networking in a face-to-face context. There was little research on how networking through information technology may facilitate the flow of tacit knowledge among individuals, for example, by enabling experts to locate each other (Marwick, 2001; Wan & Zhao, 2007). Few theoretical conclusions had adequate empirical data support. As far as the researcher is aware, there is almost no study that explored the relationship between networking in the social media context in particular and tacit knowledge sharing.

This is likely the first study to indicate that social media may facilitate tacit knowledge sharing through expert and expertise locating, inter-organisational and inter-disciplinary networking, and by providing opportunities for professional

collaboration. As mentioned above, expert locating through other information technology systems and its potential contribution to facilitate tacit knowledge sharing has also been reported in some studies (Marwick, 2001; Wan & Zhao, 2007). However, the potential of expert and expertise locating through social media in facilitating tacit knowledge sharing had not been addressed in the literature.

Inter-organisational communication and learning have also been addressed in the literature as one of the useful ways to share tacit knowledge (Collins & Hitt, 2006; Nonaka, 1994; Ortiz et al., 2008). However, the role of IT in this regard has not been well described in the literature. The current study found that social media promotes more opportunities for interaction between members of different organisations as well as different disciplines, and hence, may provide opportunities for effective tacit knowledge sharing.

Professional collaboration was also found in the study to be another aspect of networking done on social media that has the potential to facilitate tacit knowledge sharing. The effect of working together and collaborating on tacit knowledge sharing is not unknown in the literature (Collins & Hitt, 2006; Nonaka, 1994; Ruff & Wilson, 2003). Collaborating through IT and its effect on tacit knowledge sharing has also been addressed in a few studies. For example, Brink (2003) argued that information and communication technology can support tacit knowledge sharing by providing a virtual space that enables team members to work together and collaborate anytime anyplace. Haris (2009) found that there is a need for effective e-collaboration systems that support social interaction for effective transfer of tacit knowledge in small and medium-sized enterprises (SMEs). Marwick (2001) also argued that collaboration systems may facilitate tacit knowledge sharing.

However, collaboration through social media tools was rarely discussed in relation to tacit knowledge sharing. Martin-Niemi and Greatbanks' study (2010) probably was the only study that viewed new emerging Web 2.0 tools, in particular blogs, as promising tools for providing virtual collaborative environments that facilitate the conversion of tacit to explicit knowledge.

The current study also supported the views of previous studies that collaboration is one of the most effective ways to share tacit knowledge. The study also endorsed the view that social media facilitates tacit knowledge sharing by providing opportunities for collaboration either in online space, for example writing

a joint paper or producing a podcast/vodcast, or by enabling people to lay the foundations for future collaborations in real-time.

6.3.4 Storytelling

Storytelling and its role in tacit knowledge sharing have been extensively addressed in the literature (Campbell, 2008; Carud, 1997; Lyons, 2000; Mládková, 2010; Sole & Wilson, 2002; Swap, et al., 2001). A story is a virtual experience that provides opportunities for the reader/listener to acquire the other person's knowledge without experiencing it personally. It provides opportunities to pick up subtle meanings, models, and tacit relations that may not be easily shared through other mechanisms (Mládková, 2010).

In general, storytelling has been regarded as a powerful way to communicate embedded, embodied, and highly contextual knowledge through sharing anecdotes, cases and examples, lessons learned, emotions, values, and norms (Sole & Wilson, 2002). It involves sharing what the problem was and how it was solved. Stories are usually carriers of profound contextual understanding, knowledge, and experience that a person shares with other people in very simple language.

As with the other themes of the study, the literature primarily concentrated on how storytelling helps tacit knowledge sharing in a face-to-face context. A few researchers also briefly discussed digital or online storytelling through Web 2.0 tools (Malita & Martin, 2010; Martin-Niemi & Greatbanks, 2010; Robin, 2008; Strahovnik & Mecava, 2009). They argued that storytelling through Web 2.0 tools has the potential to transfer personal experiences and lessons learned more effectively than traditional mechanisms. However, almost none of these studies linked their discussion adequately with tacit knowledge sharing concepts, and only a few supported their discussion with empirical data.

The findings of the current study confirmed some of the arguments put forward in the literature (Malita & Martin, 2010; Wan & Zhao, 2007), for example that social media tools, particularly blogs, have great potential to enable individuals to share and disseminate workplace stories more effectively and interactively among the community. The study found that social media tools facilitate tacit knowledge sharing among physicians by enabling them to report challenging clinical cases and crowdsource a treatment plan, to share everyday personal experiences and lessons

learned in a story form, and to support their story using several media such as text, image, and audio-video elements on social media.

As discussed in the previous chapter, compared with other written forms of storytelling, social media has more potential and provides better opportunities for storytelling among physicians. Examples of these advantages could be the possibility to develop conversations about the stories being shared on social media, to support stories with multimedia components, to disseminate stories to a wider audience, to crowdsource, and to easily archive and retrieve a given story. This finding challenges Martin-Niemi and Greatbanks's (2010) findings that storytelling on blogs is mostly a one-way presentation of information rather than encouraging participants to engage in active discussion. The current study found that reporting stories of everyday experiences at the workplace encourages peers on social media to comment, discuss, and share their particular expert opinions and experiences.

However, despite these potential advantages of social media for storytelling, the study confirms the findings reported in the literature (for example, Mládková, 2010) that the best form of storytelling is still verbal where people can use multiple senses to connect with the story and storyteller. Storytelling on social media probably lacks this rich context for tacit knowledge sharing. However, it can be viewed as a great step forward in improving online storytelling.

6.3.5 Encountering

The theory that explained encountering or interaction with existing explicit knowledge and its potential in creating new tacit knowledge was first introduced in Nonaka and Takeuchi's (1995) knowledge creation model. According to Nonaka and Takeuchi, internalisation is "the process of embodying explicit knowledge into tacit knowledge" through learning by doing and also through reading explicit knowledge. In other words, Nonaka and Takeuchi implied that consumption, assimilation, and reflecting upon the existing explicit knowledge may lead to further internalisation and conversion of explicit-to-tacit knowledge.

Since Nonaka and Takeuchi (1995) first proposed their theory, very few studies have discussed the role that encountering with existing explicit knowledge plays in new tacit knowledge creation. Much of the literature only replicated Nonaka & Takeuchi's arguments without further investigation or developing new theories. The

only study that has briefly discussed the role of existing explicit knowledge in creating new tacit knowledge was Raisanen and Oinas-Kukkonen's (2008) study. They argued that browsing, organising, and playing with existing knowledge helps to identify problems, needs, and opportunities, which establish foundations for the comprehension and deeper understanding of the knowledge shared and therefore, provide opportunities for embodying tacit knowledge.

Both Nonaka and Takeuchi's (1995) and Raisanen and Oinas-Kukkonen's (2008) studies concentrated mainly on representing knowledge conversions and creation processes in their conceptual models. Technological contribution to tacit knowledge creation through increasing the interaction and encountering with existing knowledge was not the focus of their studies. In addition, none of these studies discussed the mechanisms that may help to increase interaction with existing explicit knowledge.

The current study confirmed Nonaka and Takeuchi's and also Raisanen and Oinas-Kukkonen's arguments that information encountering is essential for tacit knowledge creation. However, the study investigated it from a technological perspective and, further, it explored the mechanisms that facilitate encountering and interacting with existing knowledge through the use of social media tools.

The current study argued that social media increases the availability and visibility of existing explicit knowledge and therefore, it increases participants' encountering with existing explicit knowledge. Increased encountering with existing knowledge may in turn facilitate the internalisation and creation of new tacit knowledge. In this case, social media does not support tacit knowledge sharing directly. Instead, it first facilitates explicit knowledge sharing by increasing the chance of information and knowledge encountering, and then individuals who consume existing knowledge may internalise and convert that knowledge to tacit knowledge. In other words, the more people encounter new explicit information the more new tacit knowledge they may create.

In addition, the study demonstrated that social media increases participants' encountering with existing knowledge through several mechanisms that have not been addressed in the literature. It found that social media provides better opportunities for broadcasting and publicising information and has great potential for faster dissemination of information due to large audience and social network effects.

It provides a personalised and filtered information feed for participants. It constantly keeps participants up-to-date. Finally, it provides simple and quick ways to document personal experiences and knowledge which are also easy to share and also to retrieve.

The potential link between tacit knowledge sharing and those features of social media that increase the chance of information encountering has not been clearly identified and discussed in the literature. These were all new findings that the present study revealed and then connected with tacit knowledge sharing concepts. The only dimension of the "information encountering" theme that has been adequately addressed in the KM literature was knowledge documentation and storage. However, very few studies exclusively discussed the documentation of tacit knowledge.

For example, Palanisamy (2007) stressed that organisations require proper documentation of tacit knowledge for later use or retrieval. He calls for further research to develop innovative techniques for documenting tacit knowledge. Selamat and Choudrie (2007) also argued that externalised knowledge, ideas, and thoughts need to be documented. Wang and Qiu (1997) found that the documentation of tacit knowledge was one of the most effective strategies to leverage tacit knowledge sharing in the organisation.

In regard to technological contributions to the documentation of tacit knowledge, KM systems have been regarded as facilitators to document best practices and lessons learned (Renzl, 2008; Van Heijst, van der Spek, & Kruizinga, 1997). A few studies also showed that blogs (Deng & Yuen, 2012) and multimedia formats (in particular, video storytelling) (Katzeff & Ware, 2006) are effective media for documenting personal experiences.

By seeking physicians' perspectives and experiences on social media, this study found that social media also helps tacit knowledge sharing through enabling documentation of tacit knowledge that is articulated in chat rooms, discussion forums, comments, or presented in vodcasts and podcasts. Documented knowledge on social media might be regarded as explicit information. However, by adopting a tacit-explicit continuum (Blankenship & Ruona, 2009; Cavusgil, et al., 2003; Faucher, et al., 2008; Inkpen & Dinur, 1998), it can be argued that verbalised and externalised knowledge does not necessarily mean that it is completely explicit and that the process of tacit knowledge sharing has been completed.

The tacit dimension of externalised knowledge might sometimes be even stronger than its explicit dimension. Knowledge that is communicated in informal chats or discussions, or demonstrated in practical skills on videos, although recorded, still has more tacit elements. In addition, most of the knowledge shared on social media is not as organised as explicit information in databases or published explicit material. It is mostly unstructured and to some extent resembles the discussions and conversations that occur in a face-to-face interaction.

After externalisation, the documentation of tacit knowledge is probably the final phase of tacit knowledge sharing where tacit knowledge becomes relatively explicit and recorded in more standard formats. However, the tacit knowledge may never become completely explicit (Sin, 2008). There is always a tacit component in knowledge even though it is externalised and converted into an explicit form (Polanyi, 1966). Furthermore, the process of knowledge creation as depicted by Nonaka and Takeuchi (1995) proceeds in a spiral rather than a linear fashion. Therefore, documented knowledge can also set off a new spiral of knowledge creation when it is accumulated and then communicated with other people.

In summary, the study viewed the documentation of experiences on social media (explicit or tacit) as an effective way to increase information encountering, and hence, tacit knowledge sharing.

6.4 SOCIAL MEDIA TOOLS AND TACIT KNOWLEDGE SHARING

As mentioned in the introduction chapter, in order to obtain a holistic view of social media's contribution to tacit knowledge sharing, the study initially approached investigating social media as a whole rather than studying one or two types of social media. However, as the participants of the study had predominantly used Twitter, blogs, and multimedia sharing sites, such as YouTube and Vimeo, the study mostly discussed the support these platforms provided in facilitating tacit knowledge sharing among physicians. The study demonstrated how these social media tools support tacit knowledge sharing among physicians. It has also shown that different social media tools have different potential in supporting tacit knowledge sharing. Table 6.1 lists examples of social media tools that were found useful in facilitating tacit knowledge sharing among physicians.

Table 6.1.

Themes Contributing to Tacit Knowledge Sharing and Supporting Social Media Tools

Themes	**Supporting tools**
Socialising	- Twitter - Blogs
Practising	- YouTube/ Vimeo, and HQMedED - Vodcasts
Networking	- Twitter - Blogs
Storytelling	- Blogs - Podcasts/vodcasts
Encountering	- Twitter - Blogs - Podcasts/vodcasts - YouTube/Vimeo, and HQMedED

Although social media tools have been developed based on similar ideas and concepts such as user participation, collaboration, networking, and interactivity, they now have different functionalities, features, and affordances. Therefore, their ability to support tacit knowledge sharing is also different. As discussed in Chapter 5, Twitter, for instance, provides more opportunities for spontaneous and synchronous communication, and therefore is a more convenient platform for socialising and establishing conversation and dialogue. This informal socialisation on Twitter makes it also a powerful tool for mutual networking. Compared to other social media tools, Twitter also provides better opportunities for information and knowledge encountering via better facilities for broadcasting published content, receiving personalised information feed, and enabling people to easily keep updated.

However, the half-life of information on Twitter is relatively short, and conversations seem to be more ephemeral because of the continuous content stream. Therefore, Twitter's ability to support storytelling, practice demonstration, or any other rich presentation of content is limited. As discussed in Chapter 5, for storytelling, tools such as blogs and podcasts/vodcasts, which are more persistent and provide more spaces and features for presenting content, are more suitable. Blogs and blogging also play an important role in developing strong relationships and networking by providing opportunities for personal knowledge sharing, commenting, and developing meaningful discussion. Podcasts/vodcasts were also found to be great tools for tacit knowledge sharing through which physicians could record and share

their unique experiences, workplace stories, or advanced discussions about challenging problems at the workplace or current topics in their field.

Accordingly, social media channels such as YouTube, Vimeo, and HQMedED, which support multimedia components, seem more suitable for learning or demonstrating practical skills. These channels not only have the ability to quickly and almost effortlessly disseminate traditional video formats, which is proven to be useful in learning or demonstrating practical skills, but also support interactivity, commenting, asking questions, and developing ongoing discussions which help to better transfer knowledge and skills shared on the video.

In summary, social media tools each have different potential in supporting tacit knowledge sharing. The study suggests that employing a combination of social media tools might be appropriate for tacit knowledge sharing rather than using a single platform.

6.5 TOWARDS A CONCEPTUAL MODEL

The main findings of the study can be illustrated via a conceptual model that explains the major contributions of social media to facilitate tacit knowledge sharing, as experienced by the participants of the study (physicians). Figure *6.1* (see next page) shows the potential conceptual model of the study. The model is based on the thematic analysis of the data and the supporting literature. As shown in Figure *6.1*, the model has three main elements: facilitators of tacit knowledge sharing on social media (themes of the study), the continuum of tacit-to-explicit knowledge, and Nonaka and Takeuchi's knowledge creation theory, SECI[6].

The facilitators in the model actually represent the themes of the study that were found to be major contributions of social media to facilitate tacit knowledge flow among physicians. These include five themes: socialising, practising, networking, storytelling, and encountering. The themes of the study, hence called "facilitators" of tacit knowledge sharing on social media, have also been connected to the continuum of tacit-to-explicit knowledge (see Figure 2.3 in chapter 2 and Figure 4.3 in chapter 4) in the model (Figure *6.1*). Each facilitator supports knowledge with a different degree of tacitness or explicitness.

[6] SECI: Socialisation, Externalisation, Combination, and Internalisation

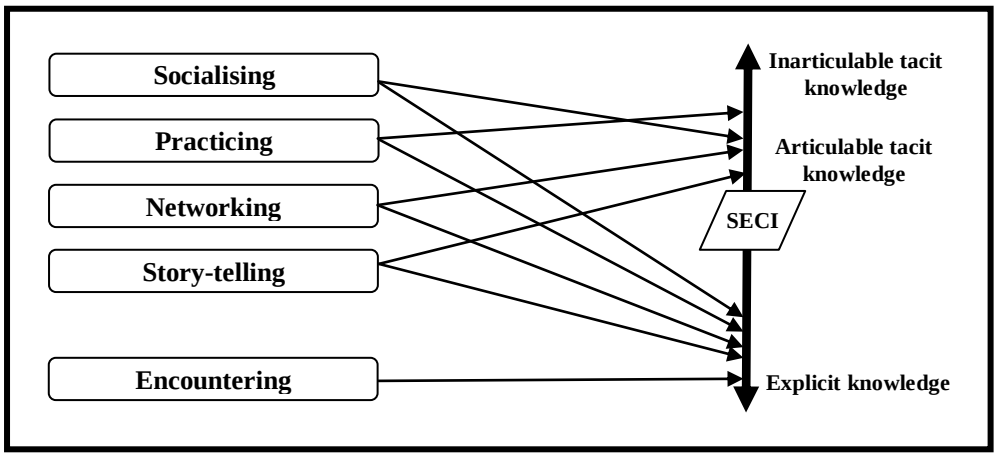

Figure 6.1. Conceptual model of tacit knowledge sharing over social media: Physicians' perspectives and experience.

Note: SECI (Socialisation, Externalisation, Combination, and Internalisation)

For example, socialising, practising, networking, and storytelling mainly facilitate knowledge with a low to medium degree of tacitness (in other words, articulable tacit knowledge). Practising might even support knowledge with a fairly high degree of tacitness (or inarticulable tacit knowledge), using multimedia components in which people can pick up subtle things directly from the videos or images shared on social media. On the other hand, encountering mostly facilitates knowledge with a low degree of tacitness. That is, it mainly facilitates explicit knowledge sharing first and then during the process of internalisation (conversion of explicit to tacit) (Nonaka & Takeuchi, 1995), the assimilated knowledge might be converted to tacit knowledge. In other words, encountering and increased interaction with existing explicit knowledge on social media may not directly help tacit knowledge to be exchanged among participants. However, the reader may read the explicit knowledge, combine it with individual experiences or other related information, internalise the accumulated knowledge, and then create new tacit knowledge.

Tacit and explicit knowledge have a more interactive relationship in that the creation of one relies on the other (Nonaka & Takeuchi, 1995; Roberts, 2000). As explained by Nonaka and Takeuchi's knowledge creation theory (SECI), explicit knowledge might always be combined, internalised, and converted to tacit form; and vice versa, tacit knowledge might also be socialised, externalised and converted to explicit form. Therefore, it can be expected that in every step of socialising, practising, networking, storytelling, and encountering on social media there might be

instances of both tacit-to-explicit and explicit-to-tacit knowledge conversions and sharing. Accordingly, SECI theory was also included in the model (Figure *6.1*) to indicate that tacit and explicit knowledge always have an interactive and dynamic relationship, that is, discussing one inevitably necessitates discussing the other as well.

Although social media supports both tacit and explicit knowledge sharing conversions by providing opportunities for socialising, practising, networking, storytelling, and encountering, these processes have been found more helpful in facilitating tacit knowledge sharing because of the social elements included in them. Explicit knowledge can also be shared with any medium without the need for interaction between people. However, tacit knowledge is mostly human-dependent and there is a need for social interaction among people for tacit knowledge to be shared. Social media provides more opportunities for social interaction, and therefore, it increases the chance of tacit knowledge sharing among individuals.

Finally, it is worth mentioning that although the facilitators of tacit knowledge sharing in the model are shown as distinct from each other, they still have intertwined relations with each other. Examples of these relationships are discussed below.

Socialising and networking. The first example might be of the relationship between socialising and networking. Socialising and networking seem to have a close relationship. Socialisation fosters bonding and mutual trust and therefore, it encourages the development and strengthening of new interpersonal relationships (J. Chen, Zhang, & Xu, 2009; Cousins, Handfield, Lawson, & Petersen, 2006; Kim, 2013). Therefore, it can be argued that the primary socialisation and conversations on social media may provide the basis for future professional networking. People who have a regular conversation and dialogue on social media are more likely to develop a strong mutual relationship in the future. Accordingly, it can also be argued that true socialisation on social media might occur mostly and frequently between people who have already networked with each other either in real-time or in an online space.

Socialising and storytelling. Socialising may also link theoretically with storytelling. People are more likely to reveal of themselves and tell their stories when they socialise with each other (Chung, 2006). Therefore, socialisation on social media may also encourage people to tell and share their everyday workplace stories.

Similarly, storytelling may also promote dialogue and socialisation among individuals (Boyce, 1996; Sole & Wilson, 2002). Hence, it can be concluded that socialisation and storytelling on social media are strongly associated with each other.

Networking and other facilitators. Networking also seems to be associated with other facilitators of tacit knowledge sharing. Indeed, it can be argued that any effort of socialisation, storytelling, practising, and information encountering on social media might foster professional networking amongst participants. Networking requires mutual trust (Peroune, 2007; Annick Willem, et al., 2006) and this mostly occurs through both formal and informal socialisation (Anderson-Gough, Grey, & Robson, 2006; Kim, 2013). On the other hand, storytelling, practising, and information encountering may encourage socialisation and trust among users of social media.

For example, storytelling establishes mutual trust (Sole & Wilson, 2002; Wilkins, 1984) and encourages conversation about the matter of the story or other relevant experiences (Boyce, 1996; Sole & Wilson, 2002). Similarly, demonstrating practical skills on social media may also inspire socialisation and encourage participants to comment, discuss, and exchange their idea, opinions, and experiences. This socialisation may then, as discussed above, foster mutual relationships between participants and lead to professional networking (J. Chen, et al., 2009; Cousins, et al., 2006; Kim, 2013).

Encountering and other facilitators. Encountering may also be associated with other facilitators of tacit knowledge sharing. It can be argued that in every step of socialisation, storytelling, networking, and practising on social media, participants may encounter new knowledge and information. As shown in the study findings, the participants always received up-dated medical information or new sources and links to further information were recommended to them by trusted people as a result of discussions in social media space. In addition, knowledge encountering on social media may also encourage people to contact the authors for further information or discussion, and this may also lay the foundation for future networking among them.

6.6 CHAPTER SUMMARY

The chapter revisited the findings of the study in relation to its objectives and the main research question. Next, each theme of the study was discussed separately

with reference to the literature. The discussions showed that while each theme has a relationship with the literature, the themes also have new meanings in the new context of social media, with new aspects, links, and implications. It was shown that the study differs from the literature in terms of focusing on a social media context and its role in facilitating tacit knowledge sharing, which has been poorly addressed in the literature.

Providing empirical data support for the arguments made in relation to ICT-mediated tacit knowledge sharing was another difference between the study and studies reported in the literature. The study findings not only confirmed some of the arguments in the literature regarding the potential of social media for tacit knowledge sharing, but also supported them with empirical data gathered in a series of semi-structured interviews conducted with physicians who were actively using social media tools.

Finally, the study findings were illustrated in a conceptual model explaining the major contributions of social media to tacit knowledge sharing. The model positioned some of the themes of the study (socialising, practising, networking, storytelling, and encountering) as facilitators of tacit knowledge sharing on social media, the continuum of tacit-to-explicit knowledge, and Nonaka and Takeuchi's knowledge creation theory, SECI. The relationships between the themes of the study were also briefly discussed in this chapter. It was shown that while the themes of the study seem distinctive they also have an intertwined relationship with one another.

The next chapter will conclude the thesis by presenting an overview of the key findings, contributions of the study, implications, limitations of the study, and recommendations for future research.

Chapter 7: Conclusion

7.1 CHAPTER PREVIEW

The aim of the study was to investigate social media and its potential in facilitating tacit knowledge sharing among physicians. The main research question was "*how do social media tools facilitate tacit knowledge sharing among physicians?*" To achieve the research goal and to answer the research question, a qualitative survey design was employed and twenty-four semi-structured interviews were conducted with physicians who were regular users of social media. The data was analysed using a thematic analysis approach. The analysis revealed five dominant themes in relation to social media support of tacit knowledge sharing, which were introduced in Chapter 5. The relation of the study themes to the past literature was also discussed and finally a conceptual model that explains tacit knowledge sharing in social media context was proposed in the previous chapter.

The current chapter is the final chapter of the study. The purpose of this chapter is to provide a summary of key findings of the study, to present study contributions to knowledge, implications, and the limitations of the study. The chapter closes with recommendations and suggestions for future work.

7.2 SUMMARY OF KEY FINDINGS

As presented in Chapters 4 and 5, the study found that tacit knowledge sharing occurs in social media among physicians who use it regularly. By adopting a tacit-explicit continuum, it was found that physicians share various types of both explicit knowledge (such as contents from published materials, links, and medical news and events) and tacit knowledge (such as clinical tips, opinions, experiences, and best practices) on social media.

After revealing instances of tacit knowledge sharing by physicians on social media in the data, the data was further scrutinised to answer the main question of the study and to determine how social media may facilitate tacit knowledge sharing based on the physicians' perspectives and experiences. Using thematic analysis, five emergent themes with over twenty sub-categories were revealed in regard to tacit knowledge sharing among physicians on social media. The themes included:

- Socialising: Providing a social place where physicians can develop a meaningful dialogue, conversation, and discussion about their everyday work;
- Practising: Providing a quick and easy way for learning, imitating, demonstrating, and benchmarking clinical skills and best practices;
- Networking: Providing great opportunities for locating peers, developing professional networking, and collaboration on an international level.
- Storytelling: Providing opportunities for sharing workplace stories, lessons learned, and experiences; and
- Encountering: Providing better opportunities for increasing visibility of and interaction with existing knowledge and information.

Based on these five major themes, and also with the help of published theories, in particular Nonaka and Takeuchi's (1995) theory, Busch's (2008) categorisation of tacit knowledge into articulable and inarticulable tacit knowledge, and the continuum of tacit to explicit knowledge (developed by investigator using examples collected from the literature), a conceptual model of tacit knowledge sharing using social media tools was proposed.

In addition, the study revealed that physicians use social media predominantly for staying connected with colleagues, reaching out to the wider community, sharing knowledge, and engaging in continued medical education, networking with like-minded people, benchmarking practice, and professional branding. Furthermore, the study found that physicians encounter several challenges when they use social media for knowledge sharing. The main challenges were maintaining confidentiality, lack of active participation, finding time, lack of trust, workplace acceptance and support, and information anarchy. The most critical issue found in adopting social media in healthcare was protecting patient privacy, and it was agreed that this needs to be carefully observed by physicians as well as relevant organisations.

The study also acknowledged the importance of trust in the process of tacit knowledge sharing on social media and showed how physicians develop and sustain trust on social media. In particular, the study revealed that physicians trust their peers on social media mainly through previous personal interactions, observing

authenticity and relevancy of voice, professional standing, consistency of communication, non-anonymous and moderated sites, and peer recommendations.

7.3 CONTRIBUTIONS TO THE KNOWLEDGE

Many studies have examined and conceptualised the role of ICT in KM processes (Ahsan, Shah, & Kingston, 2010; Franco & Mariano, 2007; Hendriks, 1999; Lopez-Nicolas & Soto-Acosta, 2010; López, Peón, & Ordás, 2009; Mvungi & Jay; Sher & Lee, 2004; Skok & Kalmanovitch, 2005; H. Song, 2007; Wild & Griggs, 2008). Nevertheless, there has been limited research conducted in the area of the contributions of ICT, in particular social media contributions, to facilitate tacit knowledge sharing exclusively. In fact, there have been contradictory views in the literature on whether ICT can actually facilitate tacit knowledge sharing and very few studies have conceptualised ICT contributions to tacit knowledge sharing.

Consistent with the researchers who argued that ICT may mediate tacit knowledge sharing (Alavi & Leidner, 2001; R. Harris & Lecturer, 2009; Hildrum, 2009; Marwick, 2001; Murray & Peyrefitte, 2007; Stenmark, 2000), this study also posited that ICT, in particular, emerging social web tools, have the potential to facilitate tacit knowledge sharing. However, compared to previous studies, the current study not only supported its arguments with empirical data gathered from the healthcare context, but also explored and identified new concepts and meanings that are particular to the social media contribution to tacit knowledge sharing.

In summary, the findings of this research contribute to the fast growing literature on the intersection of KM and ICT, by having a particular focus on physicians' tacit knowledge sharing in social media, an area that had not previously been adequately investigated. The study demonstrated and conceptualised social media's contribution to tacit knowledge sharing by identifying five major themes and about twenty sub-themes that could be regarded as the potential contributions of social media tools to facilitating tacit knowledge sharing. In addition, based on the themes that emerged from the data, and also with the help of extant theories, a conceptual model of tacit knowledge sharing using social media tools was proposed that could be regarded as another main contribution of the study.

Particular contributions of the study to existing knowledge and to the field have already been discussed in detail in the previous chapter in which each theme of the

study was discussed with reference to the literature. While the themes identified in the study had connections with previous studies investigating tacit knowledge sharing in a face-to-face context, they had new meanings in the context of social media. The study demonstrated that socialisation, networking, practising, storytelling, information encountering, and trust on social media could facilitate tacit knowledge sharing differently, compared to face-to-face interactions.

The study developed an important connection between social web communities and tacit knowledge sharing which has implications for the healthcare industry, whose clinical teams are not always physically co-located but must exchange their critical experiential knowledge. Investigating a healthcare context is indeed one of the main contributions of the study. In spite of the knowledge intensive nature of healthcare, this context suffers from a paucity of literature concerning its KM issues (Abidi, 2008; Keeling & Lambert, 2000). At this level, this study explored physicians' perspectives and experiences in regard to social web technologies and their potential for facilitating knowledge sharing among clinical communities. The study can be regarded as one of the first studies that specifically concentrated on physicians' tacit knowledge sharing through the use of social media.

The findings of the study may also contribute to the healthcare KM framework of Lusignan, Pritchard, and Chan (2002). Their model mentioned different mechanisms and examples of IT tools for different types of knowledge sharing (including tacit knowledge sharing) in the healthcare context. Based on the findings of the current study, social media tools can also be applied to the information systems (IS) domain of the Lusignan et al. model, as one of the recent IT tools for facilitating tacit knowledge sharing in the healthcare context.

Furthermore, future business models require more tele-working in which employees work more often remotely. There is always a need to re-examine recent web initiatives in terms of their efficacy and capacity for tacit knowledge sharing, the most critical knowledge of people and organisations. The findings of the study, in particular, the conceptual framework of the study, can be used as a guide in future research or examination of future tools as to how they could or could not facilitate tacit knowledge sharing.

Finally, online tacit knowledge sharing has been rarely investigated in the literature. This study opened up a new discussion that could lead to further studies in

the area of web technology's contributions in facilitating tacit knowledge sharing among other professional groups and industries.

7.4 PRACTICAL IMPLICATIONS

Harnessing and facilitating tacit knowledge among clinical teams is one of the main issues of current KM activities in healthcare organisations (Abidi, et al., 2005; Bate & Robert, 2002). Face-to-face interaction has traditionally been viewed as the best way to communicate and share tacit knowledge. However, face-to-face communication is no longer the principal way of tacit knowledge sharing in current business models, particularly where clinical teams are not always geographically co-located. Furthermore, face-to-face interaction is not always feasible due to the limited resources available, such as time, equipment, and budget, or the number of patients with particular conditions available for teaching and learning. Therefore, today the use and optimisation of IT for facilitating tacit knowledge sharing is almost inevitable (Sarkiunaite & Kriksciuniene, 2005).

The current study introduced and demonstrated social web tools as one of the recent enablers of tacit knowledge sharing. The study revealed not only the potential contributions of social media to facilitate tacit knowledge sharing, but also the challenges of adopting these emerging social platforms for knowledge sharing. The study findings may provide an opportunity for healthcare professionals to better understand the potential and challenges of employing social media platforms for knowledge sharing. These insights could be used in determining how to adopt and harness social media effectively and to maximise the benefits for the specific needs of the clinical community. This is important, as there is currently a widespread scepticism about and mistrust of the viability of social media for knowledge sharing and medical education in healthcare (Cain, 2011).

Previous research shows that unfamiliarity, lack of understanding of the benefits and values of technology, and also lack of training are the most important obstacles that influence an individual's adoption of technology (Al-Daihani, 2009; Paroutis & Al Saleh, 2009). This was also confirmed in the current study that the lack of workplace support and lack of understating the need for social media are the main challenges of adopting social media in healthcare organisations. Therefore, the findings of this research may serve as an educational source for physicians and other

clinicians involved in patient care such as nurses, radiologists, and physiotherapists. The study may help them to expand their knowledge about the potential of social media in enabling them to communicate and share knowledge with colleagues, learn and benchmark practical skills, maximise their interaction with medical information, connect with peers globally, or even communicate with patients using social media tools. As an example, when preliminary findings of the study were presented at an international conference, the paper[7] was shared in various medical blogs by physicians who were active in social media. EMcrit, a famous medical blog, used this paper and created a podcast to introduce the concept of tacit knowledge to the medical community. The podcast received many comments from the community, confirming that the main purpose of physicians joining social media conversations is actually tacit knowledge sharing. For example, one comment on the EMcrit blog post stated that:

> *One of the reasons I listen to podcasts and read EM blogs is that exact point you made: transmission of tacit knowledge. Textbooks can provide me with background knowledge but I am often left unsure how to actually apply that knowledge in clinical practice. It's like an extension of bedside teaching. Except with FOAM now I have access to expert clinician teachers from all over the world. And there's an additional bonus, I don't have to sit at my desk with a textbook open!* (Kath Woolfield, 2013)[8]

The study findings would also help healthcare providers, administrators, and IT decision-makers by providing them a valuable lens through which they can understand the scope and the impact of social media on their organisation. Through this study, they would become aware of physicians' perspectives, experiences, and challenges in using these new platforms. This can then help them to decide whether to adopt and how to adopt social media effectively.

Healthcare IT managers and knowledge management systems (KMS) developers could also use the study findings to identify and satisfy expectations and demands of physicians in using social platforms. For example, protecting patients' confidentiality was found in the study as one of the main challenges of using social media by physicians. These findings might encourage healthcare KMS developers to approach appropriate ways to protect and monitor patient privacy on social media.

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[7] Panahi, S., Watson, J., & Partridge, H. (2012). Potentials of social media for tacit knowledge sharing amongst physicians: Preliminary findings. In ACIS 2012: Location, location, location: Proceedings of the 23rd Australasian Conference on Information Systems- Geelong, Australia 2012.

[8] The comment is mentioned in Weingart (2013) *EMCrit Wee – Tacit Knowledge and Medical Podcasting*. Retrieved from http://emcrit.org/wee/tacit-knowledge-podcasting/

In summary, obtaining insights into how social media contributes to medical tacit knowledge sharing may help physicians as well as healthcare providers, administrators, and IT managers to discover new opportunities to facilitate knowledge and experience sharing among the clinical community. In addition, the findings of the study may significantly contribute to improving our understanding of how physicians use social media, and form the basis for a social media evaluation toolkit in the healthcare sector that can provide recommendations for effective design of social media applications regarding physicians' specific needs. Consequently, all this may assist healthcare organisations to provide the highest quality of patient care.

Finally, the findings of the study might also be useful for other industries in which facilitating tacit knowledge among employees is important. Theoretically, there is not much difference between different industries in terms of tacit knowledge sharing. Socialising, networking, practising, storytelling, information encountering, and trust (the main findings of the current study) for tacit knowledge sharing are as important in other industries as in the healthcare industry. Therefore, the result of the study might be applicable to other contexts as well.

7.5 LIMITATIONS

Researching tacit knowledge, as discussed in the introduction and literature review chapters, is problematic from both theoretical and methodological perspectives (Ambrosini & Bowman, 2001; Rebernik & Sirec, 2007). The current study also had both theoretical and practical limitations.

Theoretically, the aim of the study was to study only tacit knowledge sharing, and explicit knowledge was supposed to be excluded from the study. However, tacit knowledge is a complex concept and has many dimensions. The distinction between tacit and explicit knowledge in reality is not as clear as in the theoretical definitions due to the fact that the nature of tacitness always changes according to the level of expertise (novice or expert), the time, and the context in which the knowledge is shared.

Although the tacit-explicit continuum (Chennamaneni & Teng, 2011; Haldin-Herrgard, 2000; Jasimuddin, et al., 2005) was adopted for the purpose of the study, making decisions about the type, quality, and relevancy of knowledge shared among physicians on social media and interpreting them within tacit knowledge definitions

was not always a simple task. Therefore, the codes chosen and the decisions made are subject to criticism.

Another limitation of the study is related to investigating social media as a whole, rather than limiting it to one or particular types of social media tools, for example social networks or wikis. While this was helpful in terms of obtaining a holistic view and an understanding of social media contributions to tacit knowledge sharing and also to propose an overarching conceptual model, it also limited the exploration of the particular conditions, functionalities, and features of each tool in detail. Future research should examine specific social communities and different social media tools to increase the representativeness and generalisability of the study findings.

The practical limitations of the study in terms of participant recruitment and data collection were already discussed separately in the methodology chapter. In summary, finding appropriate participants who were meeting the requirements of participation in the study in terms of having sufficient engagement with social media tools (at least twice a week) as well as having sufficient clinical experience (minimum five years) was found to be difficult. In addition, some volunteers (about one third of the registered volunteers) withdrew from the study due to being in a very busy profession and the difficulty of finding time for the interview. Others also needed to be contacted many times to finally conduct the interviews.

In addition, although the participants of the study were all physicians, they had different backgrounds and specialisations, and were from different geographical locations. This heterogeneity of the study population, although ensuring that as wide a range of perspectives as possible was gathered, may also be considered as a limitation of the study. Therefore, the selected purposive and snowball sampling may also impose limitations to generalising the study findings to different communities of clinicians.

A very broad definition for a physician is a person who is qualified to practise medicine (Merriam-Webster, 2013). The sample employed in the study was small and did not include all groups of physicians with different types of specialisations. Physicians who had not adequately engaged in social media tools or had less than five years' clinical experience were also not included in the study. Therefore, the

findings of the study might be tentative and require further research with a larger worldwide representative sample of physicians.

Another practical limitation is related to transferring the meaning of tacit knowledge to the population of the study and this was sometimes difficult. During the pilot study it was noticed that some of the participants either did not understand or missed the meaning of tacit knowledge during the interview. To solve this issue, a group of terms that were found close to the meaning of tacit knowledge in the literature was used to communicate with participants. In addition, it was decided that the participants should be allowed to talk freely about their experiences of sharing any kind of knowledge on social media and then to extract the meanings and concepts related to tacit knowledge from the data in the analysis processes.

The last limitation of the study could be the researcher's bias. As it was qualitative research, the study findings might also be influenced by the researcher's personal interpretations and bias. To reduce the researcher's bias, the data analysis process (including coding, categorising, and interpreting findings) and the study findings were shared and discussed with the supervisory team, as mentioned in the methodology chapter.

Despite the limited generalisability of the study findings, the study revealed new aspects of tacit knowledge sharing through the use of social media, and opened up a new discussion in this regard which had not been adequately explored before. However, the debate on whether ICT can actually facilitate tacit knowledge sharing is still ongoing. There is still a need to examine further tools, investigate other contexts, operationalise the findings of the current study, and also seek to extend the generalisation of the findings.

7.6 CONCLUSION AND FUTURE RESEARCH

The purpose of the study was to examine the potential contributions of social media in facilitating tacit knowledge sharing among physicians. The results of the study suggest that social media has sufficient potential to support tacit knowledge sharing through several mechanisms. The study found five major emerging themes and over twenty sub-themes that could be considered as the potential of social media to facilitate tacit knowledge sharing.

In summary, the findings implied that social media can provide a space where physicians can socialise and discuss their clinical issues freely; watch, imitate, learn, and benchmark best practices shared by peers; locate and build trusted relationships with like-minded people across the globe; write and share their clinical stories in an interactive way that can also be supported by multimedia components; increase their interaction with existing knowledge and information; reach out to or obtain knowledge from much wider audiences and resources; and document and retrieve the articulated and shared tacit knowledge on social media.

Based on the thematic findings and supporting literature, the study also proposed a conceptual model (see Figure *6.1*, Chapter 6) that shows the potential patterns and relationships between the themes identified in the study and the continuum of tacit-to-explicit knowledge. The model is unique in terms of contributing and updating the existing literature in the area of information technology support for tacit knowledge sharing, in particular, by demonstrating that social media is one of the recent enablers of tacit knowledge sharing.

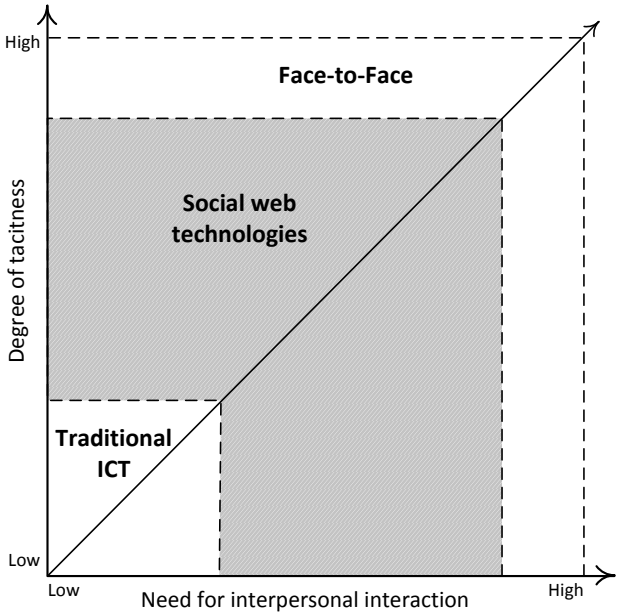

Figure 7.1. Social media versus traditional ICT versus face-to-face communication in supporting tacit knowledge sharing. Source: Author

Furthermore, as illustrated in Figure 7.1, while the study argues that compared to traditional ICT, social media facilitates tacit knowledge sharing (particularly knowledge with a low to medium degree of tacitness) by providing more opportunities for socialising, practising, networking, story-telling, and encountering,

it also acknowledges that it is still far from supporting knowledge with a high degree of tacitness in which people prefer more close and face-to-face contact. Although current advances in presenting multimedia elements and also progress in improving video-conferencing are all promising for facilitating knowledge with a high degree of tacitness, they still cannot replace face-to-face communication which provides a richer and more multi-sensory learning experience. Future advances in ICT-mediated communication, for instance, by providing a more natural way of communication through improved video-conferencing, simulation technologies, multimedia elements, and improved bandwidth might enable better facilitation of tacit knowledge capturing and sharing.

The study also acknowledges the need for further research in several areas. First, although the study contributes to bridging the gap of knowledge in the area of tacit knowledge sharing through information technology, there is still a need for further empirical studies to do so adequately. For example, the study viewed tacit knowledge more broadly as consisting of different types of experiential, personal, implicit, practical know-how, and other types of tacit knowledge. Investigating each of these dimensions or types of tacit knowledge sharing through social media is a potential theme for future research.

The qualitative findings of the study are mostly tentative and may need to be tested and validated. Operationalising the findings of the study to conduct quantitative research to validate the model and generalise the findings of the study could be a major theme for future research. In addition, examining different types of social platforms against different types of tacit knowledge, and also seeking the perspectives and experiences of different professional online communities could increase the generalisability of the current research findings. It might also be helpful to seek the perspectives of physicians who do not use social media or abandoned it for whatever reason.

Finally, although the study positioned itself within studies that consider that there is a role for ICT in facilitating tacit knowledge sharing, the study still believes that for an effective transfer of tacit knowledge, technology alone is not sufficient, as also suggested by socio-technical theory (Parker, 2011). The need for human and social dimensions is always stronger than any other dimension required for tacit

knowledge sharing. Thus, social media can only be regarded as complementary rather than a substitute for traditional mechanisms of tacit knowledge sharing.

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Appendices

Appendix A
List of resources included in the content analysis

The following is a list of factors identified from content analysis of the literature as mechanisms and conditions of tacit knowledge capturing and sharing. The list of resources selected for the content analysis is also presented after the table.

Mechanisms/Conditions	Resources
Frequent informal communication (face-to-face or virtual)	Blumenberg, Wagner, & Beimborn, 2009; Bratianu & Orzea, 2010; Brink, 2003; Cappellin, 2004; Cavusgil, Calantone, & Zhao, 2003; J. H. Chen & McQueen, 2010; Coff, Coff, & Eastvold, 2006; Collins & Hitt, 2006; Desouza, 2003; Ershova, 2009; Goffin & Koners, 2011; Haldin-Herrgard, 2000; Holste & Fields, 2010; Janson & McQueen, 2007; Jasimuddin & Zhang, 2009; Jasimuddin, 2007; K. U. Koskinen & Vanharanta, 2002; K. Koskinen, Pihlanto, & Vanharanta, 2003; Martin-Niemi & Greatbanks, 2010; Marwick, 2001; Murray & Peyrefitte, 2007; Nonaka, Toyama, & Konno, 2000; Osterloh & Frey, 2000; Rebernik & Sirec, 2007; Reychav & Weisberg, 2009; Roberts, 2000; Sanders, Steward, & Bridges, 2009; E. A. Smith, 2001; H. Smith, McKeen, & Singh, 2007; Spring, 2006; Subramaniam & Venkatraman, 2001; Thomassen & Rive, 2010; Zack, 1999
Mentoring/ apprenticeships	Askay & Spivack, 2010; Bajracharya & Masdeu, 2006; Brink, 2003; Bronzini et al., 2010; I. Y. L. Chen, Su, Huang, Lan, & Shen, 2006; Chennamaneni & Teng, 2011; Dinur, 2011; Ershova, 2009; Goffin & Koners, 2011; Goffin, Koners, Baxter, & van der Hoven, 2010; Haldin-Herrgard, 2000; Janson & McQueen, 2007; Jasimuddin & Zhang, 2009; Joia & Lemos, 2010; Leonard & Sensiper, 1998; Luoma & Okkonen, 2009; Murray & Peyrefitte, 2007; Nie, Lin, Ma, & Nakamori, 2010; Nonaka, 1994; Nonaka, et al., 2000; Peroune, 2007; Polanyi, 1966/2009; Puerto & Stighammar, 2010; Rebernik & Sirec, 2007; Rintala & Hyttinen, 2006; Roberts, 2000; Ruff & Wilson, 2003; Stover, 2004; Swap, Leonard, Shields, & Abrams, 2001; Taylor, 2007; Wang & Qiu, 2011
Storytelling (Narratives)	Bajracharya & Masdeu, 2006; Chennamaneni & Teng, 2011; Faust, 2007; Goffin & Koners, 2011; Goffin, et al., 2010; Holste & Fields, 2010; Janson & McQueen, 2007; Jasimuddin & Zhang, 2009; Kalid & Mahmood, 2009; Luoma & Okkonen, 2009; Martin-Niemi & Greatbanks, 2010; Mládková, 2010; Muthukumar & Hedberg, 2005; Nielsen & Madsen, 2006; Nonaka, 1994; Nonaka, et al., 2000; Puerto & Stighammar, 2010; Ruff & Wilson, 2003; Shim & Roth, 2007; E. A. Smith, 2001; H. Smith, et al., 2007

Mechanisms/Conditions	Resources
	Sole & Wilson, 2002; Stover, 2004; Swap, et al., 2001; Taylor, 2007; Werr & Stjernberg, 2003
Sharing experiences	Askay & Spivack, 2010; J. H. Chen & McQueen, 2010; Goffin & Koners, 2011; Goffin, et al., 2010; Leonard & Sensiper, 1998; Lindblom & Tikkanen, 2010; Martin-Niemi & Greatbanks, 2010; Marwick, 2001; Muthukumar & Hedberg, 2005; Nonaka, 1994; Nonaka, et al., 2000; Raisanen & Oinas-Kukkonen, 2008; Sanders, et al., 2009; Swap, et al., 2001; Wang & Qiu, 2011; Werr & Stjernberg, 2003
Networking (Informal relationship, close personal and interpersonal contact, intimacy)	Blumenberg, et al., 2009; Brink, 2003; Cappellin, 2004; Cavusgil, et al., 2003; J. H. Chen & McQueen, 2010; Collins & Hitt, 2006; Ershova, 2009; Faust, 2007; Fernie et al., 2003; Goffin, et al., 2010; Haldin-Herrgard, 2000; Holste & Fields, 2010; Janowicz-Panjaitan & Noorderhaven, 2009; Jasimuddin & Zhang, 2009; Joia & Lemos, 2010; K. U. Koskinen & Vanharanta, 2002; Knockaert, Ucbasaran, Wright, & Clarysse, 2011; Leonard & Sensiper, 1998; Lilleoere & Hansen, 2011; Mariano & Casey, 2007; Oguz, Marsh, & Landis, 2010; Osterloh & Frey, 2000; Peroune, 2007; Puerto & Stighammar, 2010; E. A. Smith, 2001; Rebernik & Sirec, 2007; Roberts, 2000; Wahab & Rose, 2011; Wang & Qiu, 2011; Wei, 2010; Zhang, Wang, Li, & Sci Res, 2010
Social interaction, Socialization	Askay & Spivack, 2010; Cappellin, 2004; J. H. Chen & McQueen, 2010; Dinur, 2011; Ershova, 2009; Goffin & Koners, 2011; Goffin, et al., 2010; Janowicz-Panjaitan & Noorderhaven, 2009; Joia & Lemos, 2010; Leonard & Sensiper, 1998; Lindblom & Tikkanen, 2010; Luoma & Okkonen, 2009; Martin-Niemi & Greatbanks, 2010; Marwick, 2001; Nie, et al., 2010; Nonaka, 1994; Nonaka, et al., 2000; Osterloh & Frey, 2000; Puerto & Stighammar, 2010; Rebernik & Sirec, 2007; Robert John, 2009; Roberts, 2000; Salisbury, 2001; Salleh, 2010; Scott, 2000; E. A. Smith, 2001; Stover, 2004; Taylor, 2007; Wei, 2010; Werr & Stjernberg, 2003; Zhang, et al., 2010
Personal experiences (hands-on experience, learning by doing, practice)	Bronzini, et al., 2010; Cappellin, 2004; J. H. Chen & McQueen, 2010; Collins & Hitt, 2006; Ershova, 2009; Faust, 2007; Goffin, et al., 2010; Haldin-Herrgard, 2000; Henriksen & Rolstadas, 2010; Holste & Fields, 2010; Jasimuddin & Zhang, 2009; Joia & Lemos, 2010; Knockaert, et al., 2011; Leonard & Sensiper, 1998; Nonaka, 1994; Nonaka, et al., 2000; Osterloh & Frey, 2000; Polanyi, 1966/2009; Raisanen & Oinas-Kukkonen, 2008; Raisanen & Oinas-Kukkonen, 2008; Rebernik & Sirec, 2007; Robert John, 2009; Roberts, 2000; Ruff & Wilson, 2003; Sanders, et al., 2009; Shim & Roth, 2007; E. A. Smith, 2001; Spring, 2006; Swap, et al., 2001; Taylor, 2007; Werr & Stjernberg, 2003; Yong & Ren-hui, 2008; Zack, 1999

Mechanisms/Conditions	Resources
Learning by observation and watching	Bajracharya & Masdeu, 2006; Bronzini, et al., 2010; Cavusgil, et al., 2003; Chennamaneni & Teng, 2011; Collins & Hitt, 2006; Holste & Fields, 2010; Janowicz-Panjaitan & Noorderhaven, 2009; Jasimuddin & Zhang, 2009; Leonard & Sensiper, 1998; Nonaka, 1994; Polanyi, 1966/2009; Puerto & Stighammar, 2010; Raisanen & Oinas-Kukkonen, 2008; Sanders, et al., 2009; Shim & Roth, 2007; Shim & Roth, 2007; E. A. Smith, 2001; Taylor, 2007
Informal dialogue/conversation	Brink, 2003; Dinur, 2011; Joia & Lemos, 2010; Lindblom & Tikkanen, 2010; Luoma & Okkonen, 2009; Marwick, 2001; Muthukumar & Hedberg, 2005; Nie, et al., 2010; Nonaka, 1994; Nonaka, et al., 2000; Peroune, 2007; Raisanen & Oinas-Kukkonen, 2008; Salisbury, 2001; Scott, 2000; Shim & Roth, 2007; Stover, 2004
Trust	Askay & Spivack, 2010; Bajracharya & Masdeu, 2006; Bratianu & Orzea, 2010; Brink, 2003; Cappellin, 2004; J. H. Chen & McQueen, 2010; Collins & Hitt, 2006; Dinur, 2011; Doak & Assimakopoulos, 2007; Ershova, 2009; Fernie, et al., 2003; Goffin, et al., 2010; Holste & Fields, 2010; Janowicz-Panjaitan & Noorderhaven, 2009; Jasimuddin & Zhang, 2009; Jasimuddin, 2007; Joia & Lemos, 2010; K. Koskinen, et al., 2003; Levin & Cross, 2004; Lin, 2007; J. J. Li, Poppo, & Zhou, 2010; K. Li, Zhang, & Liu, 2008; Martin-Niemi & Greatbanks, 2010; Millar & Choi, 2010; Muthukumar & Hedberg, 2005; Nonaka, 1994; Nonaka, et al., 2000; E. A. Smith, 2001; Peroune, 2007; Puerto & Stighammar, 2010; Raisanen & Oinas-Kukkonen, 2008; Roberts, 2000; Scott, 2000; Tee & Karney, 2010; Wahab & Rose, 2011; Yang & Farn, 2007; Yong & Ren-hui, 2008; Z. Li, Zhu, & Wang, 2010; Zhou, Siu, & Wang, 2010
Collaboration	Brink, 2003; Collins & Hitt, 2006; Doak & Assimakopoulos, 2007; Henriksen & Rolstadas, 2010; Holste & Fields, 2010; Irfan & Uddin-Shaikh, 2008; Knockaert, et al., 2011; Martin-Niemi & Greatbanks, 2010; Marwick, 2001; Muthukumar & Hedberg, 2005; Nonaka, 1994; Osterloh & Frey, 2000; Raisanen & Oinas-Kukkonen, 2008; Robert John, 2009; Ruff & Wilson, 2003; Scott, 2000; Stover, 2004; Taylor, 2007
Social networks-Community of practice	Askay & Spivack, 2010; Bertels, Kleinschmidt, & Koen, 2011; Blumenberg, et al., 2009; Collins & Hitt, 2006; Doak & Assimakopoulos, 2007; Endres, Endres, Chowdhury, & Alam, 2007; Fernie, et al., 2003; Hamza, 2009; Henriksen & Rolstadas, 2010; Higon et al., 2010; Holste & Fields, 2010; Irfan & Uddin-Shaikh, 2008; Janowicz-Panjaitan & Noorderhaven, 2009; Jasimuddin & Zhang, 2009; Leonard & Sensiper, 1998; Lin, 2007; Luoma & Okkonen, 2009; Mariano & Casey, 2007; Marwick, 2001; Nie, et al., 2010; Oguz, et al., 2010; Puerto & Stighammar, 2010; Robert John, 2009; Ruff & Wilson, 2003; Simmie, 2003; E. A. Smith, 2001; Spring, 2006; Stover, 2004; Zack, 1999

Mechanisms/Conditions	Resources
Use of metaphors, analogies and models	Askay & Spivack, 2010; Brink, 2003; Chennamaneni & Teng, 2011; Goffin & Koners, 2011; Goffin, et al., 2010; Holste & Fields, 2010; Jasimuddin & Zhang, 2009; Leonard & Sensiper, 1998; Marwick, 2001; Nonaka, 1994; Nonaka, et al., 2000; Puerto & Stighammar, 2010; Raisanen & Oinas-Kukkonen, 2008; E. A. Smith, 2001; Taylor, 2007
Demonstrations (show-how)	Nonaka, et al., 2000; Roberts, 2000; E. A. Smith, 2001; Spring, 2006; Taylor, 2007
Simulation, modelling, and experimentation	Bronzini, et al., 2010; Irfan & Uddin-Shaikh, 2008; Murray & Peyrefitte, 2007; Nonaka, et al., 2000; Scott, 2000; Shim & Roth, 2007; Sole & Wilson, 2002; Taylor, 2007
Questioning (asking, probing, interviewing)	Chennamaneni & Teng, 2011; Faust, 2007; Janson & McQueen, 2007; Joia & Lemos, 2010; K. U. Koskinen & Vanharanta, 2002; Martin-Niemi & Greatbanks, 2010; Marwick, 2001; Peroune, 2007; Shim & Roth, 2007; E. A. Smith, 2001; Stover, 2004; Taylor, 2007
Reflecting on practice	Goffin, et al., 2010; Haldin-Herrgard, 2000; Joia & Lemos, 2010; Nonaka, et al., 2000; Osterloh & Frey, 2000; Salisbury, 2001; Shim & Roth, 2007; Stover, 2004; Werr & Stjernberg, 2003
Access to experts (experts locating)	Brink, 2003; J. H. Chen & McQueen, 2010; Y. J. Chen, 2010; Coff, et al., 2006; Joia & Lemos, 2010; Mariano & Casey, 2007; Martin-Niemi & Greatbanks, 2010; Muthukumar & Hedberg, 2005; E. A. Smith, 2001; Soon, Kerr, & Fraser, 2006; Stover, 2004
Discussions sessions	Brink, 2003; J. H. Chen & McQueen, 2010; I. Y. L. Chen, et al., 2006; Desouza, 2003; Marwick, 2001; Muthukumar & Hedberg, 2005; Soon, et al., 2006; Werr & Stjernberg, 2003; Zack, 1999
Brainstorming	Brink, 2003; Chennamaneni & Teng, 2011; Jasimuddin & Zhang, 2009; Leonard & Sensiper, 1998; E. A. Smith, 2001
Active & guided participation	Jasimuddin, 2007; Knockaert, et al., 2011; Knockaert, et al., 2011; Osterloh & Frey, 2000; Ruff & Wilson, 2003
Documentation of experiences	Osterloh & Frey, 2000; Sanders, et al., 2009; Wang & Qiu, 2011; Wei, 2010
Imitations (mimicking behaviour)	Bronzini, et al., 2010; Holste & Fields, 2010; Leonard & Sensiper, 1998; Nonaka, 1994; Polanyi, 1966/2009; E. A. Smith, 2001; Raisanen & Oinas-Kukkonen, 2008
Lessons learned or best practice exercise, benchmarking	Chennamaneni & Teng, 2011; Hamza, 2009; Nonaka, et al., 2000; Taylor, 2007
Learning opportunities such as study missions, on the job training, tours, workshops, knowledge fairs	Bronzini, et al., 2010; Collins & Hitt, 2006; Nie, et al., 2010; Nonaka, 1994; Osterloh & Frey, 2000; Salleh, 2010; E. A. Smith, 2001; Stover, 2004; Switzer, 2008; Taylor, 2007; Wang & Qiu, 2011; Wang & Qiu, 2011

Mechanisms/Conditions	Resources
Proximity- concurrency-co-presence	Blumenberg, et al., 2009; Cappellin, 2004; Jasimuddin, 2007; Leonard & Sensiper, 1998; Lilleoere & Hansen, 2011; Nonaka, et al., 2000; Raisanen & Oinas-Kukkonen, 2008; Rebernik & Sirec, 2007; Roberts, 2000; Spring, 2006; Yong & Ren-hui, 2008
Spending time together	Dinur, 2011; Fernie, et al., 2003; Holste & Fields, 2010; K. Koskinen, et al., 2003; Leonard & Sensiper, 1998; Nonaka, et al., 2000; Rebernik & Sirec, 2007; Roberts, 2000; Sanders, et al., 2009
Climate of openness	Brink, 2003; Cappellin, 2004; Cavusgil, et al., 2003; Joia & Lemos, 2010; Stover, 2004; Wahab & Rose, 2011; Yong & Ren-hui, 2008
Rich Media- multimedia objects, video conferencing	Askay & Spivack, 2010; Brink, 2003; Chennamaneni & Teng, 2011; Coff, et al., 2006; Dinur, 2011; E. A. Smith, 2001; Faust, 2007; Irfan & Uddin-Shaikh, 2008; Jain, 2006; Joia & Lemos, 2010; Murray & Peyrefitte, 2007; Raisanen & Oinas-Kukkonen, 2008; Roberts, 2000; Scott, 2000; Soon, et al., 2006; Stover, 2004; Zack, 1999
Post-project review (debriefing)	Goffin, et al., 2010; Puerto & Stighammar, 2010; Rintala & Hyttinen, 2006; H. Smith, et al., 2007
Immediate feedback	K. U. Koskinen & Vanharanta, 2002; Salleh, 2010
Knowledge visualization, Drawings	Goffin, et al., 2010; Leonard & Sensiper, 1998; Shim & Roth, 2007
Non-verbal communication, Emotion	Askay & Spivack, 2010; Nonaka, 1994; Nonaka, et al., 2000; Thomassen & Rive, 2010
Joint activities and problem solving	Blumenberg, et al., 2009; Kim & Gong, 2009; Roberts, 2000
Co-authorships	Brink, 2003; Nie, et al., 2010
Writing memos	Rintala & Hyttinen, 2006; Stover, 2004
Incidental learning	Ruff & Wilson, 2003; Taylor, 2007
Trial and error	Leonard & Sensiper, 1998

List of resources used in the content analysis

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Appendix B
Examples of Social Networks Used by Medical Practitioners

Name of site	Type	Members	Targeted groups	Country	Website
Dxy	Online medical community	3.2 million	Medical, life sciences, and pharmaceutical professionals	China	www.dxy.cn
DocCheck	Physicians -only social network	950,000	Medical, life sciences, and pharmaceutical professionals	Europe	www.doccheck.com
Nurse.com	Online nurses community	850,428	Nurses	US	www.nurse.com
Allnurses	Online nurses community	714,092	Nurses	Worldwide	http://allnurses.com
M3	Online medical community	200,000	Medical, life sciences, and pharmaceutical professionals	Japan	www.m3.com
Doctors.net.uk	Registered doctors social network	200,000	Physicians	UK	www.doctors.net.uk
Medscape Physician Connect	Physician-only social network	170,000	+30 Medical specialties	US	www.medscape.com/connect
Doximity	Physicians only social network	170,000	Physicians	US	https://www.doximity.com
Sermo	Physician-only social network	125,000	68 Medical specialties	US	www.sermo.com
Ozmosis	Trusted Physician-only social network	Over 100,000	Physicians	US	https://ozmosis.org
Egora	Physician-only social network	Over 100,000	Physicians and healthcare professionals	France	http://www.egora.fr/
Medigate	Online medical community	100,000	Physicians	South Korea	www.medigate.net
Coliquio	Physician-only social network	78,000	Physicians	Germany	http://www.coliquio.de/
New Media Medicine	Social networking website	60,000	Doctors, medical students	UK	www.newmediamedicine.com
The doctor's channel	Educational videos for doctors	Over 50,000	Physicians	US	www.thedoctorschannel.com
Doc2doc	Professional networking for doctors	Over 40,000	Physicians	Worldwide	www.doc2doc.bmj.com

Name of site	Type	Members	Targeted groups	Country	Website
SDN (Student Doctor Network)	Online community for medical students	40,000	Medical students in all areas	US & Canada	www.studentdoctor.net
DoctorsHangout	Online physicians social network	28,964	Doctors, medical students	Worldwide	www.doctorshangout.com
e-healthspace	Physicians only social network	11,230	Physicians	Australia	www.e-healthspace.com.au
MomMD	Online community of women in medicine	9,000	Female physicians		www.mommd.com

Appendix C
Registration form for interview

Registration for Interview on "Social Media and Tacit Knowledge Sharing among Clinicians

Thank you for accepting our invitation to participate in this study. Please complete the following information to help us contact you. Your privacy is important to us. We assure you that the information that you provide below will not be passed to any third party. We will contact you soon to organize the interview time and place. Thank you for your interest.

Please provide your contact information. All fields are optional.

Name	
Gender	
Country	
City	
Speciality Field	
Years of Clinical Experience	
Phone	
Email	
Skype	

Any comments (including any preferences for your interview):

Submit

Please note that this study has been approved by the QUT Human Research Ethics Committee (approval number 1100000559). For more information about the study and its ethical clearance please click the following link: http://tinyurl.com/838ohaq

Appendix D
Participant recruitment flyer|

Queensland University of Technology
Brisbane Australia

PARTICIPATE IN RESEARCH
Information for Prospective Participants

The following research activity has been reviewed via QUT arrangements for the conduct of research involving human participation.
If you choose to participate, you will be provided with more detailed participant information, including who you can contact if you have any concerns.

Social Media and Tacit Knowledge Sharing Among Clinicians

Research Team Contacts

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Please contact the researcher team members to have any questions answered or if you require further information about the project.

What is the purpose of the research?

This study is intended to investigate contributions of social media to facilitate tacit and experiential knowledge creation and sharing among clinicians. The aim of this research is to explore clinicians' perception toward how social web technologies are/could be used for tacit knowledge sharing. **What we mean by tacit knowledge is**: The knowledge that is personal, job-specific, experience based, not documented, and even sometimes difficult to articulate fully.

Are you looking for people like me?

The research team is looking for clinicians (General Practitioners) who:

1- are experienced physicians having five years or more clinical experiences.
1- use/used social media tools (e.g. blogs, Wikis, video sharing sites) or social networks (e.g. Facebook, Sermo, Ozmosis, e-healthspace etc) in a fairly regular basis.
2- use/used social media tools for professional purposes (particularly job specific knowledge sharing purposes).

What will you ask me to do?

Your participation will involve participating in a semi-structured interview to discuss the following questions:

- Social media usage and pattern of use
- Tacit knowledge sharing mechanisms at workplace
- Potential of social media in facilitating tacit knowledge sharing
- Experiences of tacit knowledge sharing in social media
- Concerns and issues related to tacit knowledge sharing in social media
- Recommendations and suggestions

Are there any risks for me in taking part?

The researcher does not believe there are any risks beyond normal day-to-day living associated with your participation in this research.

However, it should be noted that if you do agree to participate, you can withdraw from participation at any time during the project without comment or penalty.

Are there any benefits for me in taking part?

It is expected that this project will not benefit you directly. However, it will benefit clinical communities to better understand how social platforms can be harnessed effectively and tailored for the specific needs of clinicians. The research findings can be used to form the basis for a social media evaluation toolkit in healthcare sector, to improve the education of social media users and to provide recommendations for the design of effective social media applications regarding clinicians' special needs.

Will I be compensated for my time?

We would very much appreciate your participation in this research. Although it is unlikely this project will benefit you directly, it may benefit clinical communities by shedding light on the contributions of social media to facilitate tacit and experiential knowledge sharing among clinicians by verifying the various ways of effective use of this new phenomenon.

I am interested – what should I do next?

If you would like to participate in this study, please contact the research team for details of the next step, or register your interest at http://survey.qut.edu.au/survey/173019/7ba0/.

You will be provided with further information to ensure that your decision and consent to participate is fully informed.

Thank You! **QUT Ethics Approval Number: 1100000559**

Appendix E
Interview guide

INTERVIEWING STEPS

1. Welcoming the interviewee and introducing the interviewer
2. Providing a brief overview of the research to the interviewee and encouraging her/his to ask any questions about the research
3. Informing the interviewee about recording the interview and asking her/his permission. The interviewee will also be reminded that they can withdraw from the study at any time of the interview.
4. Ensuring the interviewee that all information will be treated confidentially
5. Starting the interview by providing definitions of main terms of the topic: experiential knowledge and social media. And, ensuring that the interviewee has no difficulty in understanding the terms.
6. Beginning the interview by asking main questions outlined below. Asking sub-questions and probe question when it is appropriate and applicable
7. Finishing the interview by thanking the interviewee and informing him/her that the transcript of the interview will be returned for their perusal and revision.
8. Asking the interviewee if recommends anyone else who might be interested in the topic

DEFINITIONS OF KEY TERMS

Experiential knowledge: Job-specific knowledge and skills that people usually gain individually or as group at workplace. Therefore, it is not published academic knowledge. Examples are: hands-on experience, tips, role of thumbs, know-how, new ideas, perspectives, experiences from handling rare cases, etc.

Social media (SM): It refers to online social web tools such as blogs, wikis, social networking sites, micro-blogs, tagging, and so on. Examples are Facebook, Twitter, YouTube, wiki platforms, or professional networks for physicians such as Sermo, Ozmosis, and e-healthspace.

INTERVIEW QUESTIONS

Q1. Can you tell me a little bit about your job? What are you doing exactly? How long have you been working, and so on? (1 min)

Q2. What kind of social media (SM) tools do you usually use for professional purpose? (2 min)

- How long and how often do you usually use?
- What are the main reasons of using these tools for you?

Q3. Can you tell me what kind of information you usually share or you can find in SM environments? [Please explain]. (5min)

- Do you ever share your personal clinical experiences or opinions on SM?
- What kind of information do you think is primarily shared in SM among physicians?

Q4. Can you describe a time when you used SM to share your personal professional knowledge, that know-how you have developed over the years of doing your job? Can you tell me some concrete examples? (5- 10 min)

- Have you ever obtained a new idea, clinical tips, and insights while using SM?
- Have you ever had an unusual case by then you referred to SM to find someone to help you?
- How do you think the information on SM may help to your practice?
- Have you ever changed your practice as a result of your interaction on SM?
- How do you trust people on SM?
- Can you think of another time you used SM for experiential knowledge sharing?

Q5. What potentials do you see in SM that enable you to share your experiential knowledge? (20-25 min)

- What are the potentials of SM tools in helping you to tell your clinical stories and sharing your experiences?

- What are the potentials of SM in helping you to develop professional networking with other like-minded people around the world? How does this networking help you to share your experiential knowledge?
- Have you participated in Wiki articles? How do you think these collaborative tools may help you share your professional knowledge and skills?
- Do you use YouTube or other audio-video sharing sites for professional purposes? How do these tools help you to share your experiential knowledge or demonstrate a practice?
- Have you shared clinical images, CT scans or x-ray images in SM space? Can you tell me what the purpose of sharing was and how it helped you or your colleagues?
- Have you ever joined or used doctors' only online social networks such as Sermo, Ozmosis, e-healthspace, and so on? How are they helpful for professional knowledge sharing?
- What do you think about public social networks such as Facebook, Google+ and so on?
- How easy is to share your experiential knowledge in SM?
- Among the tools you have used which ones do you think is most effective for sharing your experiential knowledge? Why?

Q6. What are the main challenges you experienced in sharing your experiential knowledge in SM? (5 min)

- Could you tell me the time you decided not to share your personal professional knowledge in SM?
- Have you found any limitations/difficulties in sharing your knowledge over SM?

Q7. What are the differences in sharing your experiential knowledge in SM compared to face-to-face knowledge sharing mechanisms? (5 min)

- What are the advantages of SM over face-to-face interaction?
- What are the disadvantages of SM over face-to-face interaction?

Q7. Is there anything else you can tell me about SM and experiential knowledge sharing? (2 min)

INTERVIEW QUESTIONS BEFORE PILOTING

Q1. Can you tell me a little bit about your job? What are you doing exactly? How long have you been working? Etc. (1 min)

Q2. What kind of social media tools do you usually use for professional purpose?

- How long and how often?

Q3. Can you tell me what kind of information you usually share or you can find in social media environments? Please explain. (5-10 min)

- What kind of information do you think is predominantly shared in SM among clinicians?

Q4. Could you give me some examples when you shared or found tacit knowledge in SM? (10 -15min)

- Have you shared/found new idea, tips, and role of thumbs while using SM?
- How did this information help to your work?
- Can you think of another time/example you have used SM for tacit knowledge sharing?

Q5. How do you think SM enable you share your tacit knowledge? (20-25 min)

- How does SM help you tell your stories about clinical issues, hands-on experiences, rare cases, etc.?
- How building a domain of professional networking helps to share your tacit knowledge?
- How do you think collaborative writing (e.g. using wikis) may help you share your tacit knowledge and skills?
- How do you think multimedia sharing features of SM help you to share/demonstrate/capture best practices?
- How comfortable are you in sharing your tacit knowledge in SM?

Q6. What are the main challenges you experienced in sharing your tacit knowledge in SM? (5-10 min)

- Could you tell me the time you decided not to share your tacit knowledge in SM?
- What are the differences in sharing your experiential knowledge in SM compared to face-to-face knowledge sharing mechanisms?

Q7. Is there anything else you can tell me about SM and tacit knowledge sharing? (2 min)

Appendix F
Piloting the interview questions

Pilot study is a unique way to test and ensure about the research feasibility and to identify potential issues that probably will influence the quality and validity of research findings before launching it in a large scale (Blessing & Chakrabarti, 2009). In a qualitative research, the main goal of conducting pilot study is to refine data collection strategies rather than assessing the validity and reliability of findings (Morse, et al., 2002). Therefore, a pilot study was undertaken before the formal data collection for the study.

First the interview questions were informally practiced with two of colleagues in the university to ensure that the questions are clear and make sense. Next, two interviews were conducted with two main participants to see how the interview questions work in the main study.

Feedbacks and findings of the pilot study were used to revise and to ensure about appropriateness and relevancy of interview questions. The first finding of the pilot study was that some participants were found not understanding the concept of tacit knowledge appropriately during the interview sessions. As a result, as described in the next section, the term experiential knowledge and some other alternative terms were used to convey the meaning of tacit knowledge. Secondly, as a result of pilot study some new questions, in particular new probe questions, were added. Other ambiguous questions were also rephrased or altered to make them clear enough and suitable for the purpose of the study. For more information and to see how much the questions were changed before and after pilot study please see attachment A, where interview guides used before and after pilot study have been provided.

In addition to revising the interview questions as a result of conducting pilot study, other lessons were also learned during pilot study. The followings are some of these lessons that the researcher obtained from pilot study and feedbacks from supervisory team:

Wherever needed the researcher should ask more follow-up and probe questions to catch more information and detail to enlighten the aspects of the phenomenon under study. The pilot interviews showed that where more probe questions could have been asked from participants to obtain more in-depth responses. As a result, more probe

questions were added to the list of interview questions to obtain much richer data in other interviews.

What the researcher thinks about the questions may not be as same as what the respondents understand. For example, in some cases questions were asked about sharing 'personal experiences' on social media. However, it was realised that some participants interpreted it as personal opinions about patients that they visited or sharing personal opinions about workplace situation (e.g. "blood everywhere") rather than clinical personal experiences. Therefore, as a result the term 'personal clinical experiences' was preferred.

Although interview questions were already listed in an order, interviewees' responses and talks actually guided the interview sessions and how the questions were asked. In many cases, some questions were already responded by participants without asking the question listed in the interview guide. Sometimes, the discussion about one question required to ask questions that was already planned to be asked somewhere else.

In total, not major changes were made as a result of pilot study to the interview questions. However, it helped to improve the wordings of interview questions and also the process of conducting the interview. The data gathered from the pilot interviews with colleagues was not included in the data analysis. However, the data collected from the main participants during the pilot phase was found very important and relevant to the study. Therefore, this pilot data was also analysed and included in the findings of the study.

Operationalising the Concept of 'Tacit Knowledge' for the Interview

During the first two pilot interviews, it was realised that using the term 'tacit knowledge' in the interview is problematic as some of the participants did not completely understand the meaning of the term. Even though the definition and examples of 'tacit knowledge' were provided and discussed at the beginning of the interview and participants agreed on having no difficulty in understanding the term, however, it is wondered if they understood and remembered that definition throughout the interviews. Therefore, in order to communicate effectively the concept of 'tacit knowledge' with participants, a number of different layman's terms and ways of describing the concept were approached.

A list of alternative terms that are close to the concept of 'tacit knowledge' was identified from the literature. None of the terms were found full hundred per cent equivalent with the tacit knowledge definition. However, it was perceived that these terms may at least make the conversations a little bit easier. Some of the terms used to convey tacit knowledge concept were:

- Experiential knowledge
- Personal professional knowledge
- Personal clinical experiences
- Clinical know-how
- Workplace knowledge

The terms used are all have a common meaning, that is, job-specific knowledge in contrast to academic published knowledge which is clearly explicit. As described in the literature review chapter, this study adopted organisational literature's definition of tacit knowledge. According to the organisational literature, tacit knowledge is contextual and refers to know-how, skills and organisational routines and capabilities (Oguz & Sengün, 2011). This definition is slightly different from the original definition of tacit knowledge introduced by Polanyi which is discussed in the literature review chapter. The terms used in the interview questions of this study were all close to organisational definition of tacit knowledge. According to Nonaka, Toyama and Konno (2000) experiential knowledge and know-how is the most closest term for tacit knowledge.

In addition, to ensure that participants understood the terms used in the interview a brief description about each term was also provided at times. An example could be "your professional knowledge, that know-how you have built-up over the years doing your job". In some cases, examples of tacit knowledge, such as hands-on-experience, tips, rule of thumbs, were also provided for participants to convey the meaning of tacit knowledge. Moreover, whenever it was possible the terms used in the interview were changed according to the participants understanding and preference.

In spite of using different terms and approaches to convey tacit knowledge meaning to participants, the purpose was not always easily achievable. The purpose

of using those terms stated above was to lead participants to talk as much as possible about sharing types of knowledge that are close to the tacit knowledge meanings. Sometimes even it was decided to let participants freely talk about their views and experiences of knowledge sharing over social media in general without limiting them to talk only about tacit knowledge sharing. Since, the data analysis then could refer to the original definitions of tacit knowledge to examine and reveal part of the talks that were principally related to tacit knowledge sharing.

Appendix G
An example of coding interview (using NVivo software)

Have you shared/obtained new idea, tips, role of thumbs while using social media (during chatting, discussing, watching videos, etc)?

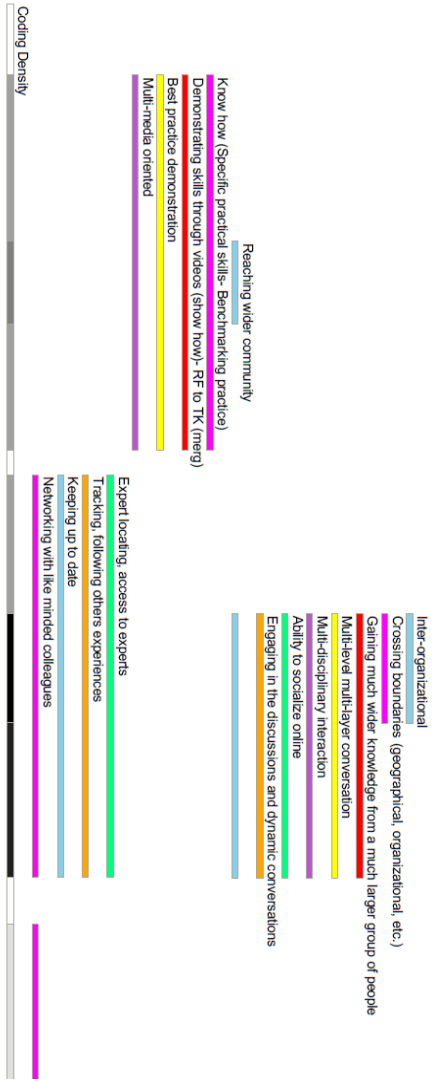
Yeah absolutely. I think probably a great example of this would be EMCrit.org's blogging and posting on emergency airway management where there's now as far as I'm aware, three cases that we have had fed back to us that after the teaching that the author and I provided during the posting on blog sites and three people that as far as we were aware of in the last six months have responded that as a result of what they saw us teach, what they heard us teach about and they looked at the resources that we posted, that they'd actually performed emergency surgical airways on actual patients in emergencies and they were all successful. So to me, that's a very powerful demonstration of a very simple but widely accessible method of teaching such as the internet and social media, actually leading to the saving of lives. So three people's lives at the moment are owed to the fact that some doctor somewhere, watched that blog site, watched the videos we recorded, listened, well not listened, well listened as well as read what was posted and taught between the EMCrit author [X] and myself and they fed back to us directly that as a result of that direct learning, they actually applied those techniques successfully in an emergency.

How did the information on social media help to your work?

Oh, I think it has helped a lot. I think it keeps me up to date with areas of controversy within the academic literature. So that, when there's controversy or uncertainty within the academic literature, so it's not a black and white issue that's answered by research, then it's a matter of human nature that different doctors will interpret that controversy in different ways. So one way that I have resolved that for myself, try and keep up to date with the cutting edge of the literature as well as trying to figure out how I'm going to approach a controversy, then discussing it with colleagues around the world. So hearing the opinions of what people would do in New York versus what people do in Britain, versus people what do in Norway as well as the Australian colleagues that are networking with us. that gives us a very rich blend of experience and because of the nature of the discussion is, you know we feel that we can all come to some kind of our own better understanding of the controversy and how it's probably going to be resolved in the future, or it may not. But either way, I personally find that's how it helps me in that the interaction between colleagues around the world, dealing with the same issue and controversy helps me have a much broader understanding of the issue.

You talked about professional networking with other like-minded people around the world. How this networking helps you to share your experiential knowledge?

Traditionally, you know we would travel overseas to a conference, present something that we think is important and then have an opportunity to be asked questions and then other colleagues from around the world who have seen the presentation at the conference might come up and ask us and we mscight get into contact with each other. That is the traditional way, that is still the main way of academic communication. However, having done that, so for example last year I went to London to present some work I'd done and there was a bit of interest and we talked about



Appendix H
Initial code list

Nodes

Name	Sour	References
SM contribution to TKS	0	0
Creating spcace to watch, observe, demonstrate, or imittate	3	10
Creating a space for real time interaction (to talk, discuss, comment)	3	36
Increasing interplay with others	1	1
ask clinical questions and get clinical responses quickly	2	10
multilevel multilayer conversation	1	1
Getting help from others	2	3
Commenting	2	4
Discussing things	1	8
Rule of thumb	1	5
Talking to other physicians	2	2
Archiving articulated knowledge	1	7
Opening up networks for like minded people	2	10
build network of trust	1	1
Availibility (anywhere, anytime)	3	11
Crossing boundaries (geographical, organizational, etc.)	2	2
Independent of time and space	2	2
Having knowledge stream on the go	1	1
Spread information out straightaway	2	2
Space for clincal story-telling	3	12
Talking about rules of thumbs, tips, and tricks	2	6
User-generator contents, no moderator	1	1
Inter-professional Inter-sectoral collaboration networking	3	6
Multi-level multi-layer conversation	1	1
Covering wide-ranging information from different parties	1	1
Getting response for your clinical questions from four five different people [	2	2
Experience sharing	2	13
Knowing different ways of doing the same thing	1	2
discuss the different options	1	1
Engaging in conversation	1	1
Rare share of personal experience	1	2
Other	0	0
Online teleconferencing, encouraging people to say and open things more	1	1
Searchable	0	0
Reaching wider community	3	8
Sociable place	0	0
Keeping up of what is happening internationally- Knowing the degree of kn	3	7
Easy to use	3	9
Cost effective	2	5
Expert locating	2	5
knowing pioneers in your field	1	2

Nodes

Name	Sour	References
Tracking, following others experiences	1	1
Increasing visibility of information	2	9
Reasons of use	0	0
Getting peer-reviewed information and recourses	1	1
Reaching wider community	2	4
Information dissemination	1	3
Being part of the community	2	2
Discussing things	1	8
Getting free information	1	2
Asking clinical practical questions	2	9
Talking with, informing patients	2	2
Talking to other physicians	2	2
Archiving information	1	6
Getting real-time information	1	1
Doing reviews and research in the literature	1	1
Writing clinical cases	3	5
Seeking help from others	1	4
Continuing medical education	2	3
Networking with like-minded people	2	9
Personal professional branding	1	1
Other	0	0
Keeping up of what is happening internationally- Knowing the degree of knowl	3	7
Type of tools	0	0
Blogs	3	14
Wiki	2	4
Other	0	0
Social networks	0	0
Online video calling	0	0
Microblogs	0	0
Multi-media sahring sites	0	0
Challenges	0	0
Using the other people	1	1
Risky place	1	2
New approches	2	3
Potential of losing competetive advantage	1	3
Lack of proper professional networks in Australia	1	1
Time consuming	2	4
Workplace problems	0	0
Getting some advertisement and promotions	1	1
None-professional information sharing by some doctors	1	1
Lak of understanding about SM	1	1
Lack of content creators (lurkers)	1	1
Other	0	0

Appendix I
Revised code list (first review)

Nodes

Name	Sou	References
SM contribution to TKS	0	0
Best practice demonstration	14	37
Watching videos	7	9
Listening to podcasts	9	18
Demonstrating skills through videos (show how)- RF to TK (merg)	15	22
Image sharing and discussing about that	11	15
Multi media capability	1	3
Ability to socialize online	5	9
Clinical Q & A	11	31
Seeking second opinion & help - Seeking reassurance --	12	26
Engaging in the discussions and dynamic conversations	18	54
Continued to offline conversation sometimes	3	3
Multi-level multi-layer conversation	13	19
Networking with like minded colleagues	23	65
Expert locating, access to experts	8	14
build network of trust	1	1
Inter professional inter sectoral collaboration networking	15	35
Collaboration	9	15
Ubiquitousness of access	11	18
Crossing boundaries (geographical, organizational, etc.)	9	13
Independent of time and place	10	16
Having knowledge stream on the go	11	20
Spread information out straightaway -- fast dissem	3	3
Independent of time and space	5	10
Space for interactive clinical story-telling	15	28
User-generator contents	2	2
Case reporting or case-based discussions- RF to tacit knowledge	5	10
Limitations due to privacy issues	1	1
Multi media oriented	3	4
Anecdotal experience sharing	8	23
Miscellaneous	0	0
Searchable	4	5
Reaching wider community	20	40
Sociable place	2	2
Keeping up to date	20	42
Easy to use	24	53
Cost effective	14	27
Openness- Democratizing healthcare	15	32
Archiving articulated knowledge	11	21
Internalization	14	25
Crystalization and externalization	7	10
Increasing visibility of or interplay with information	12	21

Nodes

Name	Sou	References
Faster dissemination (information reiteration)	14	31
Broadcasting or publicising	7	12
Personalized news feed	5	8
Trust	11	25
Personal interactions- Already know and met F-to-F	6	6
Authenticity and relevancy of voice	11	12
Background check	4	5
Professional standing- Reputation (well known people or site)	4	5
Reommended, peer reviewed	3	3
Intentions, altrusim, Affirmation	5	7
Moderatoted, registered, and non-anonymous nature of sites	3	5
Consistency of message - Frequent communication	4	4
Reasons of use	0	0
Getting information filtered by experts- peer-reviewed information and recourses	12	20
Information dissemination	5	8
Being part of the community	4	7
Patients education- Helping and informing patients	10	20
Doing reviews and research in the literature	3	4
Continued medical education (Facilitating)	16	28
Personal professional branding	7	7
Refer to SM contribution	0	0
Popularity- People using these tools	1	2
Effectiveness- RF to Benefits. effects on practice	3	4
Stay connected with colleagues	5	6
Mutual benefit- Drivers of k sharing	1	1
Change management	1	1
Preparing for fellowship exams	1	2
Getting publications before published	1	1
Experiential learning (sharing and obtaining experiential knowledge)	1	2
Pesonal knowledge sharing to wider audience	2	2
Health care advocacy	1	2
Benchmarking practice	1	2
Moulding and advancing the information	3	4
Getting involved in ehealth	1	1
Type of tools	0	0
Dr only SN	6	6
Non social media tools	0	0
Blogs	3	14
Wiki	2	4
Social networks	0	0
Online video calling	0	0
Microblogs	0	0
Multi-media sharing sites	0	0
RSS Feeds- Mainly Google reader	4	4

Nodes

Name	Sou	References
Kind of information	0	0
Tacit knowledge	5	11
Clinical practical tips	14	31
Case based discussions	13	41
Clinical Q & A	8	20
Personal professional experiences- expertise	19	52
Cutting edge concepts, ideas, topic, issues or advances	12	25
Personal expert opinions-suggestions or frustration (Anecdotal)	18	41
Problem solving	9	18
Nuances- Subtle learning	5	7
Know how (Specific practical skills- Benchmarking practice)	14	44
Other	0	0
Explicit knowledge	3	5
Literature	17	24
Presentations or lecture notes	8	11
Medical News	8	9
Peer reviewed links	9	14
Challenges	0	0
Risking your career	6	7
Concerns of going to public (confidency)	9	12
Other	14	23
Lack of proper professional networks	3	3
Time and effort consuming	17	28
Lack of workplace support	11	26
Information anarchy	11	13
Lak of understanding about SM	12	18
Lack of use and lack of active partcipants	11	25
Lack of internationally accepted SM policy	4	5
Maintaining patients, employer, clleagues confidentiality	22	51
Lack of trust	10	14
Other	1	2